

## Operating Instructions

Differential pressure transmitter with  
metallic measuring diaphragm

### VEGADIF 65

4 ... 20 mA



Document ID: 36236



**VEGA**

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#### Safety instructions for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

Editing status: 2013-04-10

# 1 About this document

## 1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup as well as important instructions for maintenance and fault rectification. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

## 1.2 Target group

This operating instructions manual is directed to trained specialist personnel. The contents of this manual should be made available to these personnel and put into practice by them.

## 1.3 Symbolism used



### Information, tip, note

This symbol indicates helpful additional information.



**Caution:** If this warning is ignored, faults or malfunctions can result.

**Warning:** If this warning is ignored, injury to persons and/or serious damage to the instrument can result.

**Danger:** If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.



### Ex applications

This symbol indicates special instructions for Ex applications.



### List

The dot set in front indicates a list with no implied sequence.



### Action

This arrow indicates a single action.



### Sequence

Numbers set in front indicate successive steps in a procedure.



### Battery disposal

This symbol indicates special information about the disposal of batteries and accumulators.

## 2 For your safety

### 2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the plant operator.

During work on and with the device the required personal protective equipment must always be worn.

### 2.2 Appropriate use

VEGADIF 65 is a differential pressure transmitter for measurement of flow, level, differential pressure, density and interface.

You can find detailed information on the application range in chapter "*Product description*".

Operational reliability is ensured only if the instrument is properly used according to the specifications in the operating instructions manual as well as possible supplementary instructions.

For safety and warranty reasons, any invasive work on the device beyond that described in the operating instructions manual may be carried out only by personnel authorised by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden.

### 2.3 Warning about incorrect use

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

### 2.4 General safety instructions

This is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.

The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for trouble-free operation of the instrument.

During the entire duration of use, the user is obliged to determine the compliance of the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

### 2.5 Safety label on the instrument

The safety approval markings and safety tips on the device must be observed.

## 2.6 CE conformity

The device fulfills the legal requirements of the applicable EC guidelines. By affixing the CE marking, we confirm successful testing of the product.

You can find the CE Certificate of Conformity in the download section of our homepage.

## 2.7 Fulfillment of NAMUR recommendations

NAMUR is the automation technology user association in the process industry in Germany. The published NAMUR recommendations are accepted as the standard in field instrumentation.

The device fulfills the requirements of the following NAMUR recommendations:

- NE 21 – Electromagnetic compatibility of equipment
- NE 43 – Signal level for malfunction information from measuring transducers
- NE 53 – Compatibility of field devices and display/adjustment components

For further information see [www.namur.de](http://www.namur.de).

## 2.8 Safety instructions for oxygen applications

For instruments in oxygen applications the special instructions in chapters "*Storage and transport*", "*Mounting*" as well as "*Technical data*" under "*Process conditions*" must be noted. Furthermore the valid national regulations, implementation instructions and memorandums of the professional associations must be noted.

## 2.9 Environmental instructions

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified according to DIN EN ISO 14001.

Please help us fulfill this obligation by observing the environmental instructions in this manual:

- Chapter "*Packaging, transport and storage*"
- Chapter "*Disposal*"

## 3 Product description

### 3.1 Configuration

#### Scope of delivery

The scope of delivery encompasses:

- VEGADIF 65 differential pressure transmitter
- Depending on the version, ventilation valves and/or screw plugs (details see chapter "Dimensions")
- Optional accessory
- Documentation
  - this operating instructions manual
  - Operating instructions manual "Display and adjustment module" (optional)
  - Supplementary instructions manual "Heating for display and adjustment module" (optional)
  - Operating instructions "Chemical seal CSB" (optional)
  - Operating instructions "Chemical seal CSS" (optional)
  - Supplementary instructions manual "Plug connector for continuously measuring sensors" (optional)
  - Ex-specific "Safety instructions" (with Ex versions)
  - Certificate "For oxygen application" (with respective versions)
  - if necessary, further certificates

#### Constituent parts

The following illustration shows the components of VEGADIF 65:

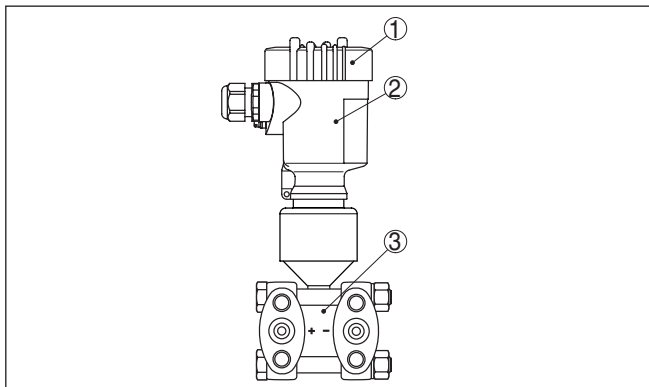


Fig. 1: VEGADIF 65 in basic version

- 1 Housing cover, optionally with integrated display and adjustment module
- 2 Housing with electronics
- 3 Process component with measuring cell

The components are available in different versions.

The nameplate contains the most important data for identification and use of the instrument:

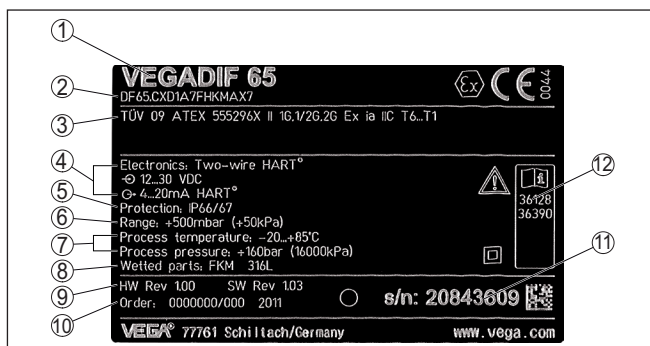


Fig. 2: Layout of the type label (example)

- 1 Instrument version
- 2 Product code
- 3 Approvals
- 4 Electronics
- 5 Protection rating
- 6 Measuring range
- 7 Process temperature, process pressure
- 8 Material, wetted parts
- 9 Hardware and software version
- 10 Order number
- 11 Serial number of the instrument
- 12 ID numbers, instrument documentation

With the serial number, you can access the delivery data of the instrument via [www.vega.com](http://www.vega.com), "VEGA Tools" and "serial number search". In addition to the type label outside, you can also find the serial number on the inside of the instrument.

### 3.2 Principle of operation

#### Application area

VEGADIF 65 is a differential pressure transmitter for measurement of flow, level, differential pressure, density and interface. Measured products are gases, vapours and liquids.

### Flow measurement

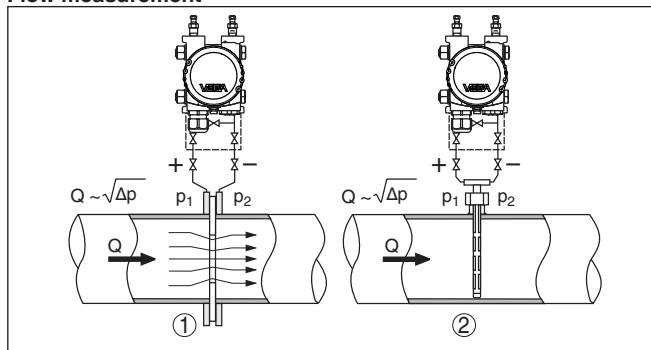


Fig. 3: Flow measurement with VEGADIF 65 and DP flow element,  $Q$  = flow,  $\Delta p$  = differential pressure,  $\Delta p = p_1 - p_2$

- 1 Orifice
- 2 Pitot tube

### Level measurement

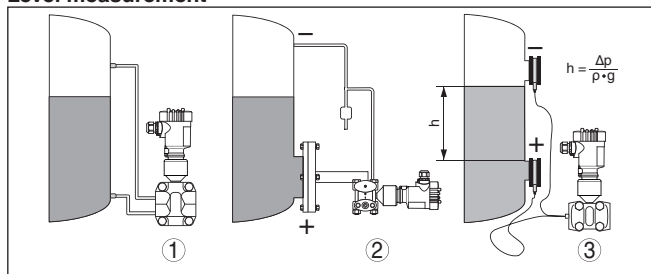


Fig. 4: Level measurement with VEGADIF 65.  $\Delta p$  = differential pressure,  $\rho$  = density of the medium,  $g$  = acceleration of gravity

- 1 Basic version with effective pressure lines
- 2 Version with flange chemical seal
- 3 Version with capillaries and cell chemical seals

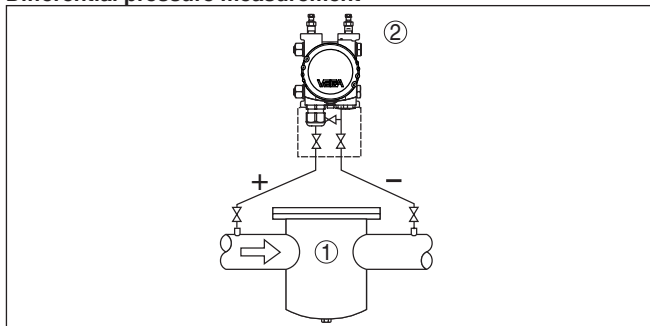
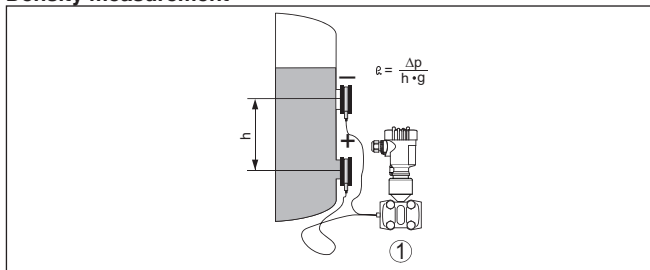
**Differential pressure measurement**

Fig. 5: Differential pressure measurement with VEGADIF 65

- 1 Filter
- 2 VEGADIF 65

**Density measurement**Fig. 6: Density measurement with VEGADIF 65,  $h$  = defined mounting distance,  $\Delta p$  = differential pressure,  $\rho$  = density of the medium,  $g$  = acceleration of gravity

- 1 VEGADIF 65

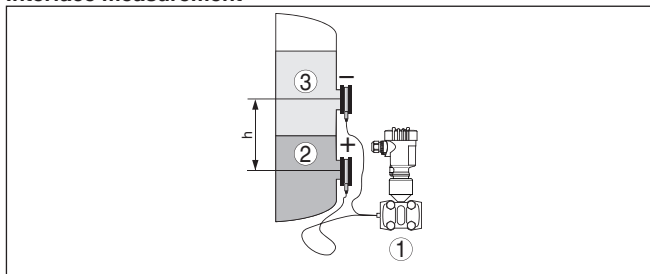
**Interface measurement**

Fig. 7: Interface measurement with VEGADIF 65

- 1 VEGADIF 65
- 2 Liquid with higher density
- 3 Liquid with lower density

### Functional principle

A metallic measuring cell is used as sensor element. The process pressures are transmitted via the separating diaphragms and filling oils to a resistance measuring bridge (semi-conductor technology).

The difference between the acting pressures generates a change in the bridge voltage. This change is measured, further processed and converted into a corresponding output signal.

The markings "+" and "-" on the process component in chapter "Mounting and connection instructions" must therefore be noted when connecting to the process. The pressure acting on "+" goes positive, the pressure acting on "-" goes negative into the calculation of the pressure difference.

The configuration of the measuring cells differs depending on the measuring range:

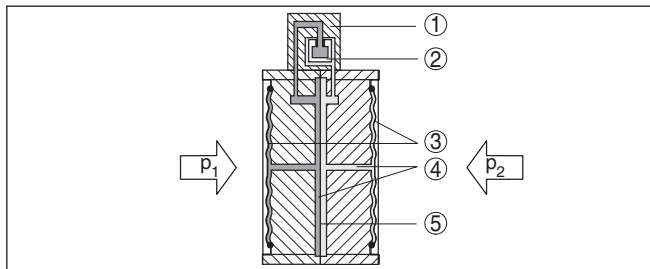


Fig. 8: Metallic measuring cell 10 mbar and 30 mbar -  $p_1$  and  $p_2$  process pressures

- 1 Measuring element
- 2 Silicone diaphragm
- 3 Separating diaphragm
- 4 Filling oil
- 5 Integrated overvoltage arrester

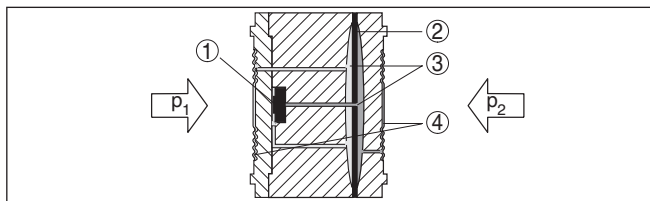


Fig. 9: Metallic measuring cell from 100 mbar -  $p_1$  and  $p_2$  process pressures

- 1 Measuring element
- 2 Overload diaphragm/Middle diaphragm
- 3 Filling oil
- 4 Separating diaphragm

### Voltage supply

4 ... 20 mA two-wire electronics for voltage supply and measured value transmission on the same cable.

The supply voltage range can differ depending on the instrument version. The exact range is stated in chapter "Technical data".

The backlight of the display and adjustment module is powered by the sensor. The prerequisite for this is a supply voltage at a certain

level. The exact voltage specifications are stated in chapter "*Technical data*".

The optional heating requires its own operating voltage. You can find details in the supplementary instructions manual "*Heating for display and adjustment module*".

This function is generally not available for approved instruments.

### 3.3 Operation

The instrument can be adjusted with the following adjustment media:

- With the display and adjustment module
- with the suitable VEGA DTM in conjunction with an adjustment software according to the FDT/DTM standard, e.g. PACTware and PC

### 3.4 Packaging, transport and storage

#### Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test based on ISO 4180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.



#### Caution:

Instruments for oxygen applications are sealed in PE foil and provided with a label "Oxygen! Use no Oil". Remove this foil just before mounting the instrument! See instruction under "*Mounting*".

#### Transport

Transport must be carried out under consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

#### Transport inspection

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

#### Storage

Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

#### Storage and transport temperature

- Storage and transport temperature see chapter "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 ... 85 %

### 3.5 Accessories and replacement parts

#### Display and adjustment module

The display and adjustment module PLICSCOM is used for measured value indication, adjustment and diagnosis. It can be inserted into the sensor and removed at any time.

You can find further information in the operating instructions "*Display and adjustment module PLICSCOM*" (Document-ID 27835).

#### Interface adapter

The interface adapter VEGACONNECT 4 enables the connection of communication-capable instruments to the USB interface of a PC. For parameter adjustment of these instruments, an adjustment software such as PACTware with VEGA-DTM is required.

You can find further information in the operating instructions "*Interface adapter VEGACONNECT*" (Document-ID 32628).

#### External display and adjustment unit

VEGADIS 61 is suitable for external measured value indication and adjustment of plics® sensors. It is connected to the sensor with an up to 25 m long, four-wire, screened standard cable.

You can find further information in the operating instructions "*VEGADIS 61*" (Document-ID 27720).

#### External display and adjustment unit VEGADIS 62

VEGADIS 62 is suitable for measured value indication and adjustment of sensors with HART protocol. It is looped into the 4 ... 20 mA/HART signal cable.

VEGADIS 62 is suitable for measured value indication with sensors without HART protocol.

You can find further information in the operating instructions "*VEGADIS 62*" (Document-ID 36469).

#### Protective cap

The protective cover protects the sensor housing against soiling and intense heat from solar radiation.

You will find additional information in the supplementary instructions manual "*Protective cover*" (Document-ID 34296).

#### Oval flange adapter

The oval flange adapter enables the connection of a ½ NPT tube to a VEGADIF 65 or a valve block. By selecting the suitable materials, the oval flange adapter can be adapted to all processes.

You can find additional information in the supplementary instructions "*Mounting accessory pressure*" (Document-ID 43478).

#### Valve blocks

Valve blocks enable simple installation and setup of a differential pressure transmitter. When the process valves are closed, the equalization valve enables a pressure compensation for the measuring chambers. This allows the zero point of the pressure transmitter to be adjusted.

You can find additional information in the supplementary instructions "*Mounting accessory pressure*" (Document-ID 43478).

#### Mounting bracket

The mounting bracket is used for wall or tube mounting of VEGADIF 65. It is supplied with strap for tube mounting and faxing screws 7/16 UNF, M10 for VEGADIF 65. The material used is 316L.

You can find additional information in the supplementary instructions "*Mounting accessory pressure*" (Document-ID 43478).

#### **Chemical seal**

By connecting chemical seals CSS and CSB, the application range can be extended. For example, it is also possible to realize interface and density measurements with connected chemical seals CSB.

By installing chemical seals, applications with corrosive, highly viscous and hot products can be also be realized.

You can find additional information in the operating instructions "*Chemical seal CSS or CSB*" (Document-ID 36133 or 36134).

#### **Electronics module**

The electronics module is a replacement part for pressure transmitter VEGABAR. One version is available for each type of signal output.

You find further information in the operating instructions "*Electronics module VEGABAR series 50 and 60*" (Document-ID 30175).

## 4 Mounting

### 4.1 General instructions to use the instrument

#### Suitability for the process conditions

Make sure that all parts of the instrument coming in direct contact with the process, especially the sensor element, process seal and process fitting, are suitable for the existing process conditions, such as process pressure, process temperature as well as the chemical properties of the medium.

You can find the specifications in chapter "*Technical data*" and on the nameplate.

#### Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give the instrument additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to outdoor mounting as well as installation in areas where high humidity is expected (e.g. through cleaning processes) or on cooled or heated vessels.

#### Ventilation

The ventilation for the electronics housing is realised via a filter element in the vicinity of the cable glands.

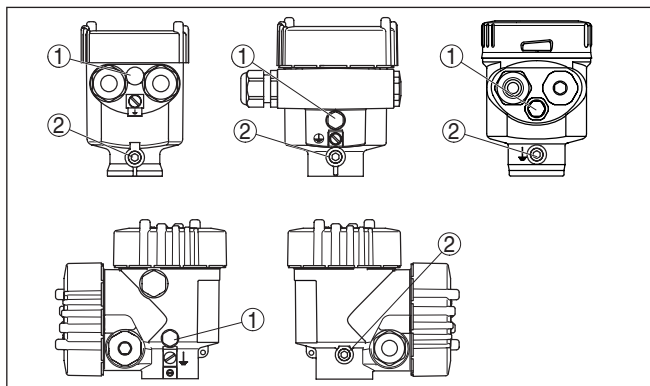


Fig. 10: Position of the filter element with single and double chamber housing

1 Filter element for ventilation of the electronics housing

2 Blind plug



#### Information:

Make sure that the filter element is always free of buildup during operation. A high-pressure cleaner may not be used for cleaning.

#### Effective pressure transmitter

DP flow elements are calculated for certain pipeline and operating data. Therefore, check the pipeline data before installation at the measuring point and compare the measurement loop number.

Detailed instructions for mounting the DP flow element are stated in DIN EN ISO 5167 as well as in the instrument documentation from the respective manufacturer.

#### Effective pressure lines

You will find general recommendations for the installation of effective pressure lines in the corresponding national or international standards. When installing effective pressure lines outdoors, consider applying suitable anti-freeze protection, e.g. tube heating. Install effective pressure lines with a monotonic downward slope of at least 10 %.

#### Vibrations

In case of strong vibrations at the application position, the instrument version with external electronics should be used.

#### Temperature limits

Higher process temperatures often mean also higher ambient temperatures for electronics and connection cable. Make sure that the upper temperature limits stated in chapter "*Technical data*" for the environment of the electronics housing and connection cable are not exceeded.

### 4.2 Instructions for oxygen applications

#### Oxygen applications

Oxygen and other gases can be explosive when brought into contact with oils, grease and plastics, so the following measures must also be taken:

- All components of the plant, such as e.g. measuring instruments must be cleaned according to the requirements of BAM (DIN 19247)
- Depending on the seal material, certain temperatures and pressures must not be exceeded in oxygen applications, see chapter "*Technical data*"



#### **Danger:**

Instruments for oxygen applications must be unpacked just before mounting. After removing the protective cover of the process fitting, the label "O<sub>2</sub>" will be visible on the process fitting. Penetration of oil, grease and dirt should be avoided. Danger of explosion!

### 4.3 Mounting and connection instructions

#### Connection plus/minus side

When connecting the VEGADIF 65 to the measurement loop, take note of the plus/minus side of the process component. The plus side is marked with a "+", the minus side with a "-" on the process component next to the oval flanges.

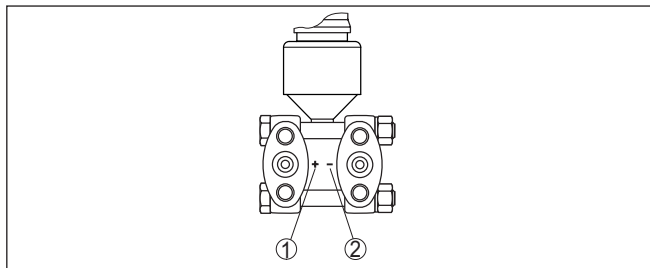


Fig. 11: Marking for plus/minus side on the process component

- 1 Plus side
- 2 Minus side

## Mounting arrangement

The following illustration shows the elements for a tube mounting and an example for a mounting arrangement with valve block.

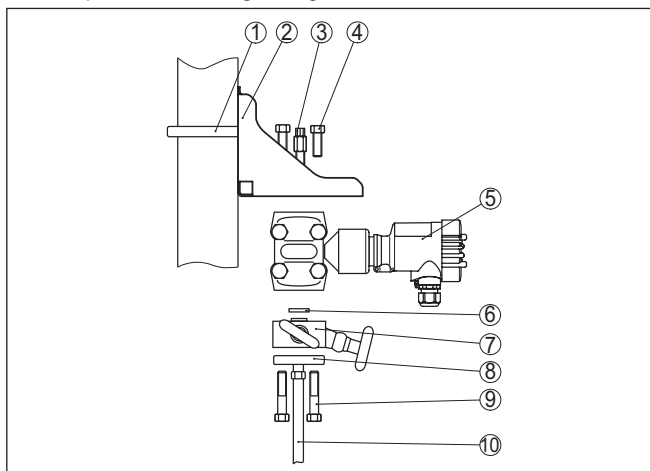


Fig. 12: Mounting arrangement with tube mounting

- 1 Strap for tube mounting
- 2 Mounting bracket
- 3 Ventilation valve
- 4 Fixing screws
- 5 VEGADIF 65
- 6 PTFE seal
- 7 Valve block
- 8 Oval flange adapter
- 9 Fixing screws
- 10 Effective pressure line

## Valve blocks

Valve blocks enable the simple installation and setup of the differential pressure transmitter. They separate the pressure transmitter from the process side and enable also a check of the measurement loop. They are available as 3-fold and 5-fold version. The integrated equalization valve enables a pressure compensation between plus and minus side

during the setup. Thanks to the valve block it is possible to dismount the VEGADIF 65 without interrupting the process. This means higher plant availability and simpler setup or maintenance.

The 3-fold valve block with flanging on both sides enables a mechanically stable connection between the VEGADIF 65 and e.g. the tapping points or the flange plate of a pitot tube. With the five-fold valve block, two additional valves allow blowing out the process lines or checking the VEGADIF 65 in installed condition.

### Connect 3-fold valve block

The following illustration shows the connection of the 3-fold valve block.

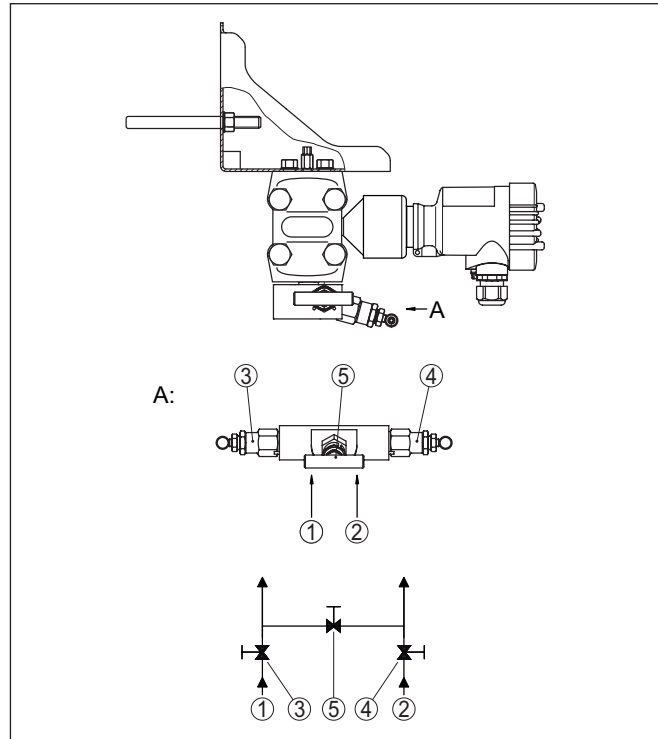


Fig. 13: Connection of a 3-fold valve block

- 1 Process fitting
- 2 Process fitting
- 3 Inlet valve
- 4 Inlet valve
- 5 Breather valve

### 3-fold valve block, flanging on both sides

The following illustration shows the connection of the 3-fold valve block, flanging on both sides.

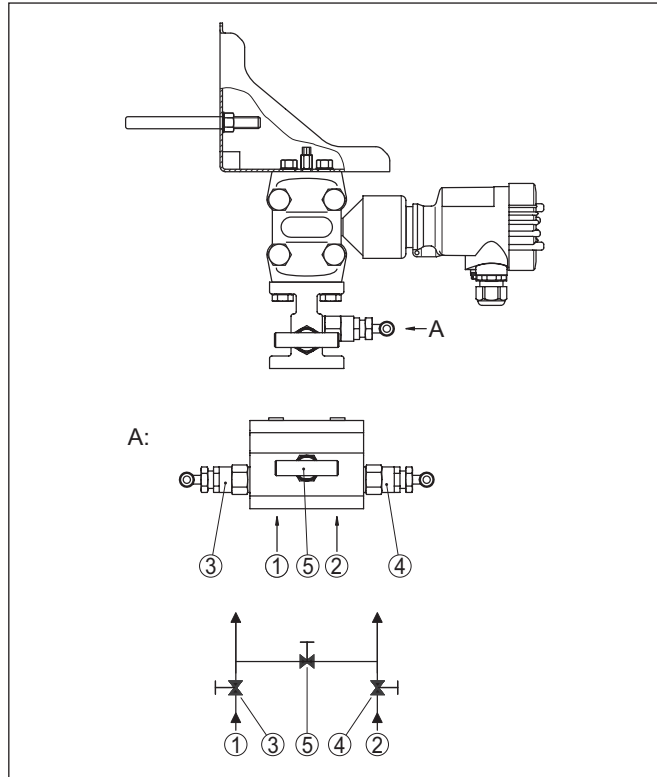


Fig. 14: Connection of a 3-fold valve block, flanging on both sides

- 1 Process fitting
- 2 Process fitting
- 3 Inlet valve
- 4 Inlet valve
- 5 Breather valve

## 5-fold valve block

The following illustration shows the connection of the 5-fold valve block.

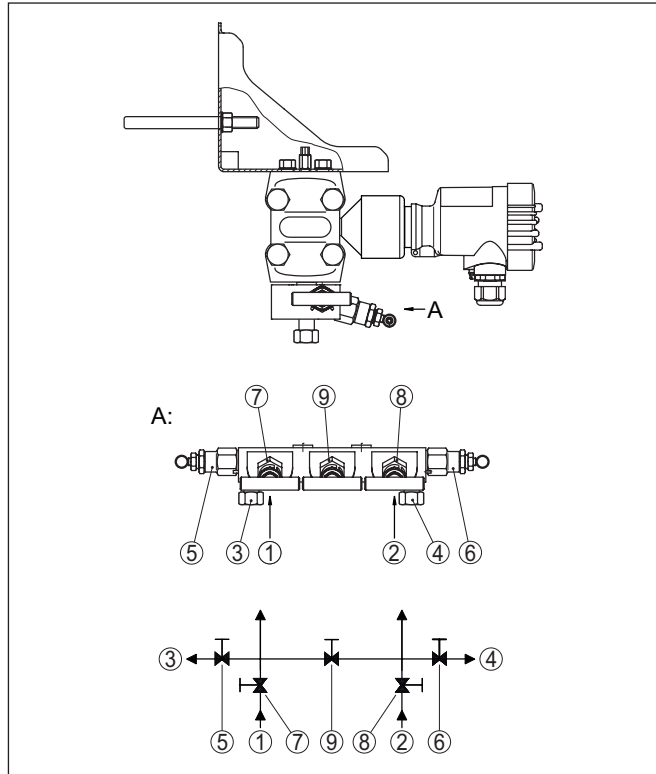


Fig. 15: Connection of a 5-fold valve block

- 1 Process fitting
- 2 Process fitting
- 3 Check/Ventilate
- 4 Check/Ventilate
- 5 Valve for checking/ventilating
- 6 Valve for checking/ventilating
- 7 Inlet valve
- 8 Inlet valve
- 9 Breather valve

#### 4.4 Measurement setup flow

##### In gases

- Mount VEGADIF 65 above the measurement loop so that condensate can drain off in the process cable.

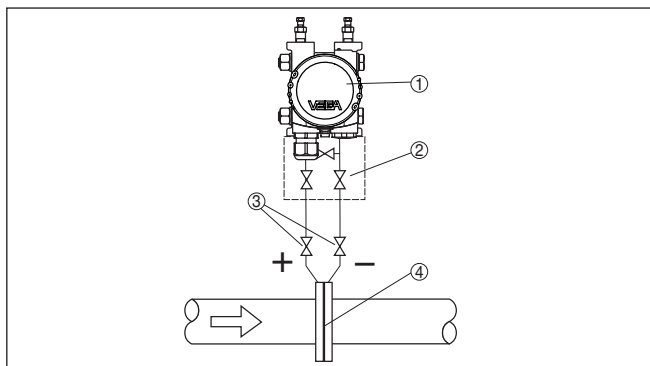


Fig. 16: Measurement setup with flow measurement of gases, connection via 3-fold valve block

- 1 VEGADIF 65
- 2 3-fold valve block
- 3 Blocking valves
- 4 Orifice or impact pressure probe

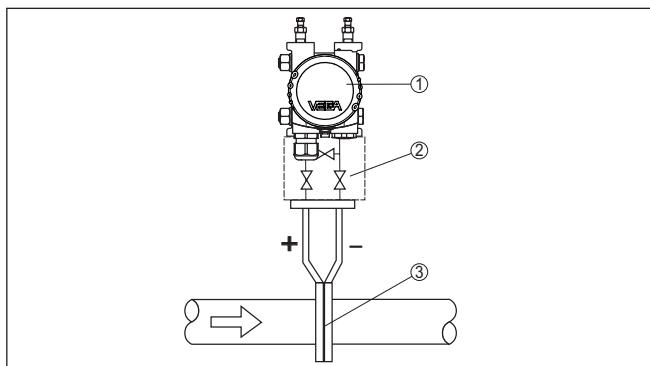


Fig. 17: Measurement setup with flow measurement of gases, connection via 3-fold valve block, flanging on both sides

- 1 VEGADIF 65
- 2 3-fold valve block, flanging on both sides
- 3 Orifice or impact pressure probe

## In vapours

1. Mount VEGADIF 65 below the measurement loop
2. Mount condensate vessels at the same height with the discharge socket and at the same distance to VEGADIF 65
3. Fill the effective pressure lines to the height of the condensate vessels before setup

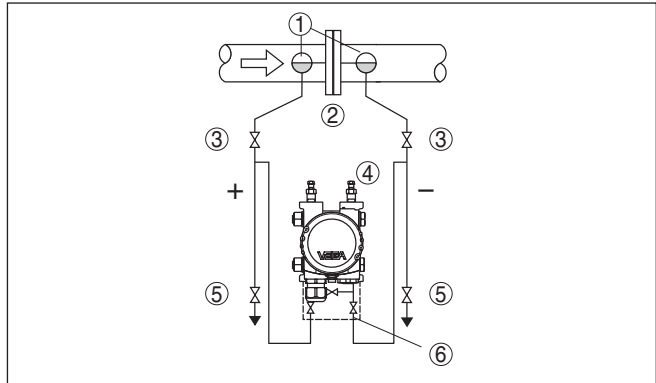


Fig. 18: Measurement setup, flow measurement in vapours

- 1 Condensate vessels
- 2 Orifice or impact pressure probe
- 3 Blocking valves
- 4 VEGADIF 65
- 5 Drain or blow-off valves
- 6 3-fold valve block

When using a 5-fold valve block, the drain or blow-off valves are already integrated.

### In liquids

1. Mount VEGADIF 65 below the measurement loop so that the effective pressure lines are always filled with liquid and gas bubbles can bubble up to the process line
2. For measurements in products with solid content such as e.g. dirty liquids, the installation of separators and drain valves is recommended to enable collection and removal of debris and sediment.
3. Fill the effective pressure lines to the height of the condensate vessels before setup

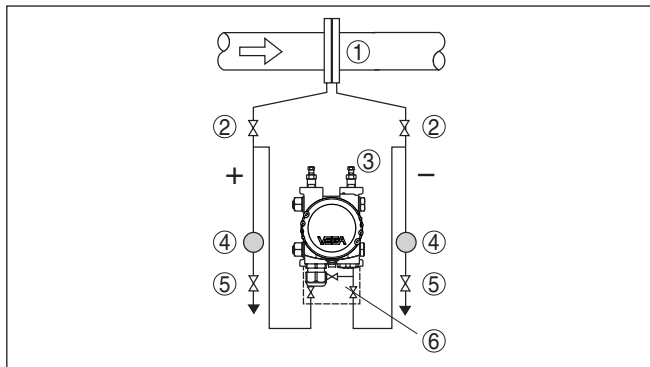


Fig. 19: Measurement setup, flow measurement in liquids

- 1 Orifice or impact pressure probe
- 2 Blocking valves
- 3 VEGADIF 65
- 4 Separator
- 5 Drain valves
- 6 3-fold valve block

#### 4.5 Measurement setup level

##### In open vessels with effective pressure line

1. Mount VEGADIF 65 below the lower measurement connection so that the effective pressure lines are always filled with liquid
2. Minus side is open to the atmospheric pressure
3. When measuring liquids with solid content, the mounting of separators and drain valves is useful to be able to avoid and remove buildup.

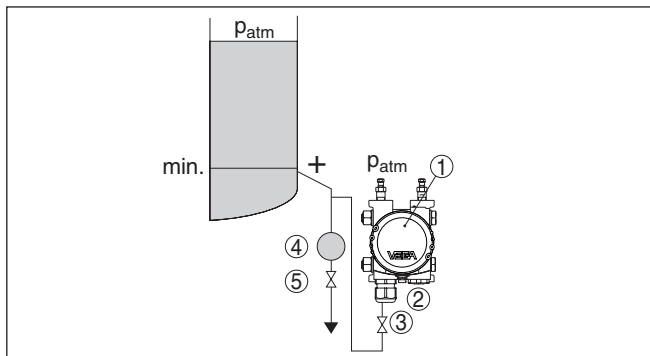


Fig. 20: Measurement setup, level measurement in the open vessel

- 1 VEGADIF 65
- 2 Minus side is open to the atmospheric pressure
- 3 Blocking valve
- 4 Separator
- 5 Drain valve

**In open vessels with single chemical seal**

1. Mount VEGADIF 65 directly to the vessel
2. Minus side is open to the atmospheric pressure

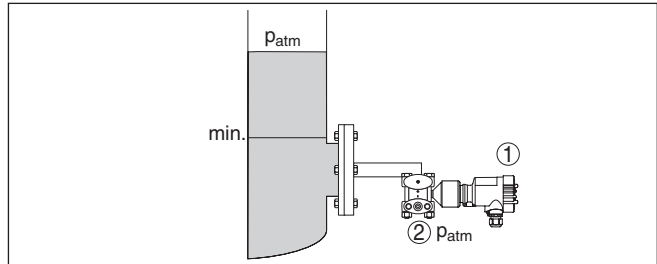


Fig. 21: Measurement setup, level measurement in the open vessel

- 1 VEGADIF 65
- 2 Minus side is open to the atmospheric pressure

**In closed vessels with effective pressure lines**

1. Mount VEGADIF 65 below the lower measurement connection so that the effective pressure lines are always filled with liquid
2. Connect minus side always above the max. level
3. For measurements in products with solid content such as e.g. dirty liquids, the installation of separators and drain valves is recommended to enable collection and removal of debris and sediment.

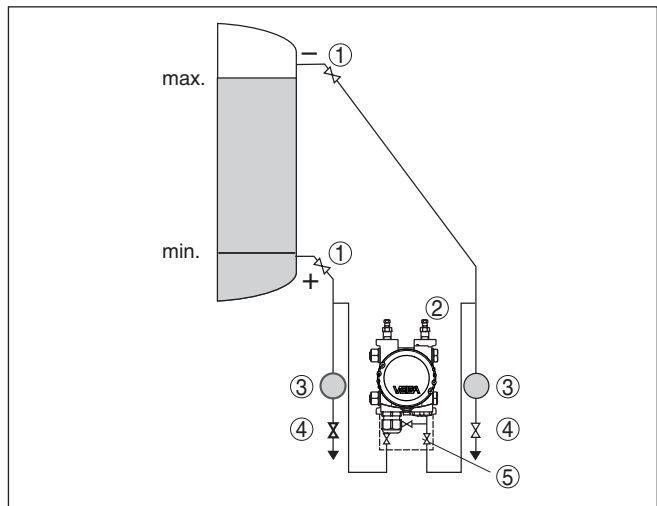


Fig. 22: Measurement setup, level measurement in closed vessel

- 1 Blocking valves
- 2 VEGADIF 65
- 3 Separator
- 4 Drain valves
- 5 3-fold valve block

## In closed vessels with single chemical seal

1. Mount VEGADIF 65 directly to the vessel
2. Connect minus side always above the max. level
3. For measurements in products with solid content such as e.g. dirty liquids, the installation of separators and drain valves is recommended to enable collection and removal of debris and sediment.

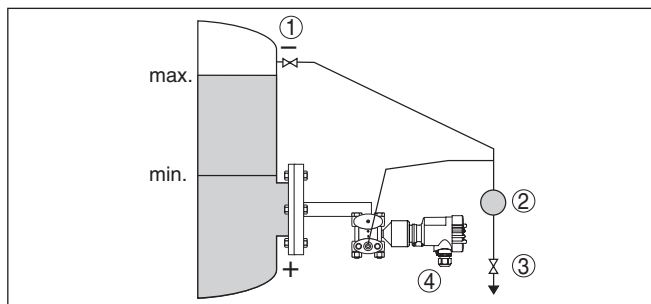


Fig. 23: Measurement setup, level measurement in closed vessel

- 1 Blocking valve
- 2 Separator
- 3 Drain valve
- 4 VEGADIF 65

## In closed vessels with double chemical seal

1. Mount VEGADIF 65 below the lower chemical seal
2. The ambient temperature should be the same for both capillaries



### Information:

Level measurement is only ensured between the upper edge of the lower and the lower edge of the upper chemical seal.

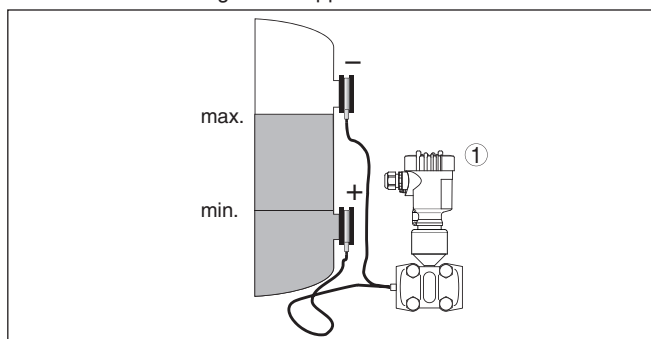


Fig. 24: Measurement setup, level measurement in closed vessel

- 1 VEGADIF 65

## In closed vessels with steam layering with effective pressure line

1. Mount VEGADIF 65 below the lower measurement connection so that the effective pressure lines are always filled with liquid
2. Connect minus side always above the max. level
3. The condensate vessel ensures a constant pressure on the minus side

4. For measurements in products with solid content such as e.g. dirty liquids, the installation of separators and drain valves is recommended to enable collection and removal of debris and sediment.

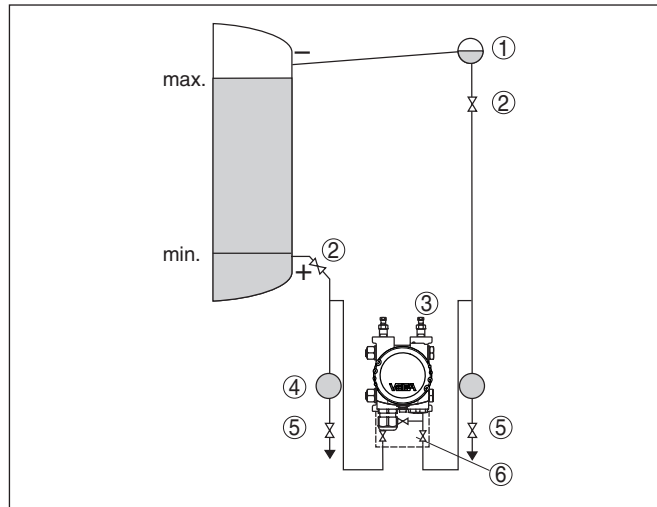


Fig. 25: Measurement setup in closed vessel with superimposed steam

- 1 Condensate vessel
- 2 Blocking valves
- 3 VEGADIF 65
- 4 Separator
- 5 Drain valves
- 6 3-fold valve block

**In closed vessels with superimposed steam with single chemical seal**

1. Mount VEGADIF 65 directly to the vessel
2. Connect minus side always above the max. level
3. The condensate vessel ensures a constant pressure on the minus side
4. For measurements in products with solid content such as e.g. dirty liquids, the installation of separators and drain valves is recommended to enable collection and removal of debris and sediment.

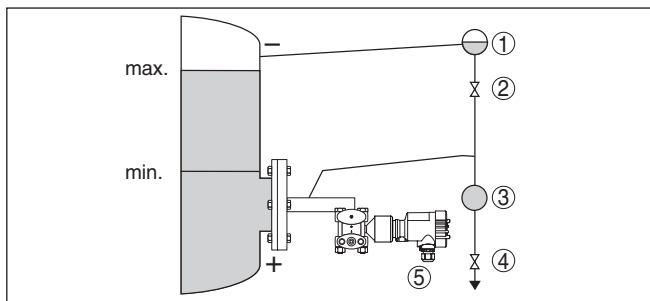


Fig. 26: Measurement setup in closed vessel with superimposed steam

- 1 Condensate vessel
- 2 Blocking valve
- 3 Separator
- 4 Drain valve
- 5 VEGADIF 65

## 4.6 Measurement setup density and interface

### Density measurement

In a vessel with varying level and homogeneous density distribution, density measurement with a differential pressure transmitter can be realized. The connection to the vessel is made via a chemical seal on two measuring points. To reach a high accuracy, the distance between these points must be as big as possible. The density measurement is only ensured with a level above the upper measuring point. If the level drops below the upper measuring point, the density measurement is interrupted.

This density measurement functions with open but also with closed vessels. Make sure that small density changes cause only small changes to the measured differential pressure. Select a suitable measuring range.

The density measurement is carried out in the mode level measurement.

1. Mount VEGADIF 65 below the lower chemical seal
2. The ambient temperature should be the same for both capillaries

#### Example for a density measurement:

Distance between the two measurement points: 0.3 m

Min. density: 1000 kg/m<sup>3</sup>

Max. density: 1200 kg/m<sup>3</sup>

Measured differential pressure:  $\Delta p = \rho \cdot g \cdot h$

The min. adjustment is carried out for the differential pressure measured at density 1.0:

$\Delta p = \rho \cdot g \cdot h$

$= 1000 \text{ kg/m}^3 \cdot 9.81 \text{ m/s}^2 \cdot 0,3 \text{ m}$

$= 2943 \text{ Pa} = 29.43 \text{ mbar}$

The max. adjustment is carried out for the differential pressure measured at density 1.2:

$$\begin{aligned}\Delta p &= \rho \cdot g \cdot h \\ &= 1200 \text{ kg/m}^3 \cdot 9.81 \text{ m/s}^2 \cdot 0.3 \text{ m} \\ &= 3531 \text{ Pa} = 35.31 \text{ mbar}\end{aligned}$$

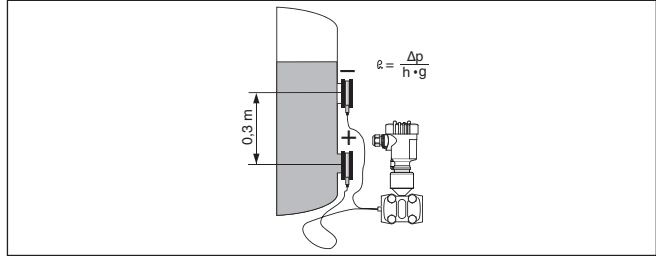


Fig. 27: Measurement setup with density measurement

### Interface measurement

In a vessel with varying level, an interface measurement with a differential pressure transmitter can be realized. The connection on the vessel is carried out via a chemical seal on two measuring points. An interface measurement is only possible if the densities of the two products remain the same and the interface is always between the two measuring points. The total level must always be above the upper measuring point.

This density measurement functions with open but also with closed vessel.

#### Example for an interface measurement:

Distance between the two measurement points: 0.3 m

Min. density: 800 kg/m<sup>3</sup>

Max. density: 1000 kg/m<sup>3</sup>

The min. adjustment is carried out for the differential pressure occurring with density 0.8:

$$\begin{aligned}\Delta p &= \rho \cdot g \cdot h \\ &= 800 \text{ kg/m}^3 \cdot 9.81 \text{ m/s}^2 \cdot 0.3 \text{ m} \\ &= 2354 \text{ Pa} = 23.54 \text{ mbar}\end{aligned}$$

The max. adjustment is carried out for the differential pressure occurring with density 1.0:

$$\begin{aligned}\Delta p &= \rho \cdot g \cdot h \\ &= 1000 \text{ kg/m}^3 \cdot 9.81 \text{ m/s}^2 \cdot 0.3 \text{ m} \\ &= 2943 \text{ Pa} = 29.43 \text{ mbar}\end{aligned}$$

3. Mount VEGADIF 65 below the lower chemical seal
4. The ambient temperature should be the same for both capillaries

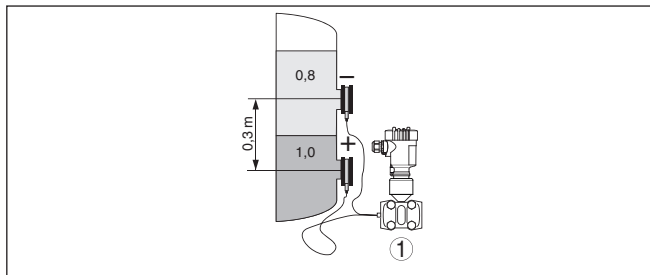


Fig. 28: Measurement setup with interface measurement

## 4.7 Measurement setup differential pressure

**In gases and vapours**

→ Mount VEGADIF 65 above the measurement loop so that condensate can drain off in the process cable.

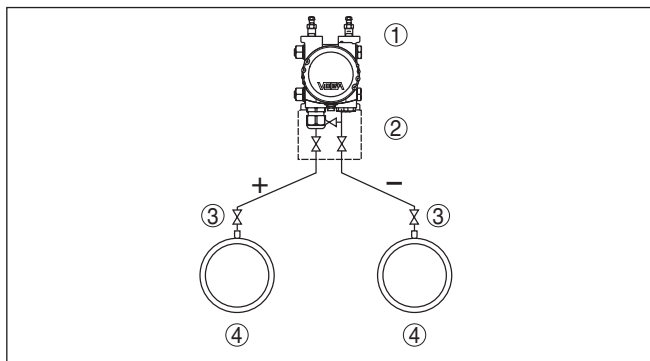


Fig. 29: Measurement setup with differential pressure measurement between two pipelines in gases and vapours

- 1 VEGADIF 65
- 2 3-fold valve block
- 3 Blocking valves
- 4 Pipelines

**In vapour and condensate plants**

→ Mount VEGADIF 65 below the measurement loop so that some condensate can collect in the effective pressure lines.

The ventilation is carried out via the ventilation valves on the instrument, the 5-fold valve block enables blowing out the cables.

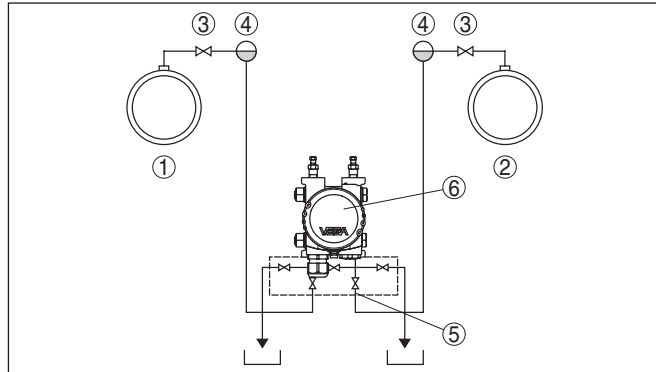


Fig. 30: Measurement setup with differential pressure measurement between a vapour and a condensate cable

- 1 Vapour cable
- 2 Condensate cable
- 3 Blocking valves
- 4 Condensate vessels
- 5 5-fold valve block
- 6 VEGADIF 65

## In liquids

1. Mount VEGADIF 65 below the measurement loop so that the effective pressure lines are always filled with liquid and gas bubbles can bubble up to the process line
2. For measurements in products with solid content such as e.g. dirty liquids, the installation of separators and drain valves is recommended to enable collection and removal of debris and sediment.

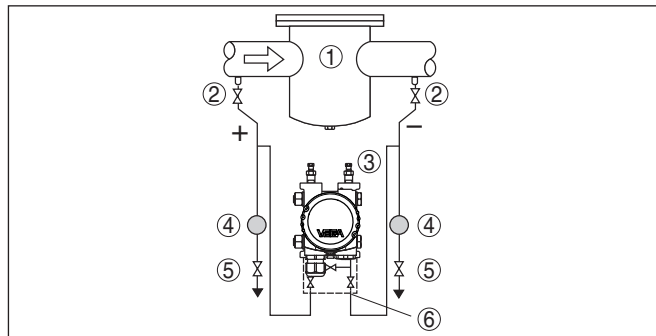
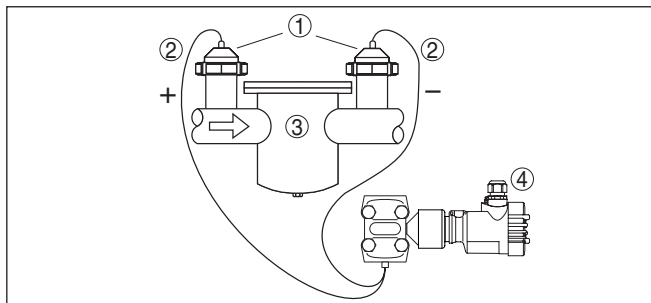


Fig. 31: Measurement setup, flow measurement in liquids

- 1 E.g. filter
- 2 Blocking valves
- 3 VEGADIF 65
- 4 Separator
- 5 Drain valves
- 6 3-fold valve block

1. Mount chemical seal with capillaries on top or laterally on the pipeline
2. In vacuum applications: Mount VEGADIF 65 below the measurement loop
3. The ambient temperature should be the same for both capillaries



*Fig. 32: Measurement setup, differential pressure measurement in gases, vapours and liquids*

- 1 Chemical seal with bolting
- 2 Capillaries
- 3 E.g. filter
- 4 VEGADIF 65

1. Mark the holes according to the following drilling template
2. Depending on the mounting surface, fasten the wall mounting plate with 4 screws

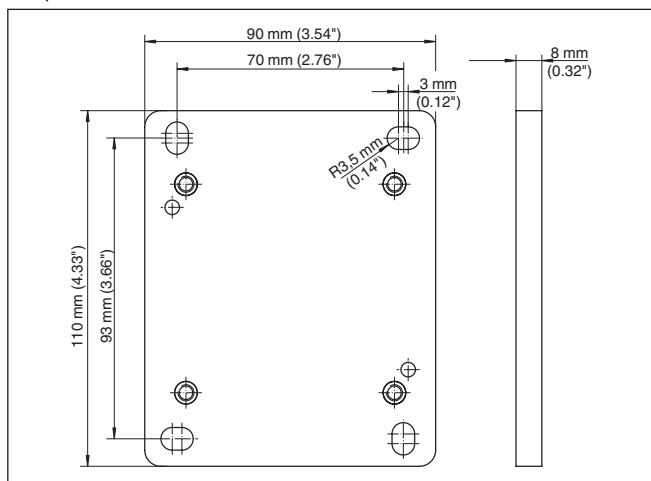


Fig. 33: Drilling template - wall mounting plate

Mount the wall mounting plate so that the cable entry of the socket housing points downward. The socket housing can be displaced by 180° to the wall mounting plate.

#### 4.9 Installation control

Check the following after mounting the instrument:

- Did you tighten all screws?
- Closing screws and ventilation valves closed

## 5 Connecting to power supply

### 5.1 Preparing the connection

#### Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltage surges are expected, overvoltage arresters should be installed



#### Tip:

We recommend using VEGA overvoltage arresters B63-48 and ÜSB 62-36G.X.

#### Take note of safety instructions for Ex applications



In hazardous areas you must take note of the respective regulations, conformity and type approval certificates of the sensors and power supply units.

#### Voltage supply

Power supply and current signal are carried on the same two-wire cable. The voltage supply range can differ depending on the instrument version.

The data for power supply are specified in chapter "*Technical data*".

Provide a reliable separation between the supply circuit and the mains circuits according to DIN EN 61140 VDE 0140-1. The VEGA power supply units VEGATRENN 149AEx, VEGASTAB 690, VEGADIS 371 as well as all VEGAMETs meet this requirement.

Keep in mind the following additional factors that influence the operating voltage:

- Output voltage of the power supply unit can be lower under nominal load (with a sensor current of 20.5 mA or 22 mA in case of fault message)
- Influence of additional instruments in the circuit (see load values in chapter "*Technical data*")

#### Connection cable

The instrument is connected with standard two-wire cable without screen. If electromagnetic interference is expected which is above the test values of EN 61326 for industrial areas, screened cable should be used.

Use cable with round cross-section. A cable outer diameter of 5 ... 9 mm (0.2 ... 0.35 in) ensures the seal effect of the cable gland. If you are using cable with a different diameter or cross-section, exchange the seal or use a suitable cable gland.

#### Cable gland ½ NPT

On the instrument with cable entry ½ NPT and plastic housing there is a metallic ½" threaded insert moulded into the plastic housing.



#### Caution:

No grease should be used when screwing the NPT cable gland or steel tube into the threaded insert. Standard grease can contain additives that corrode the connection between threaded insert and housing. This would influence the stability of the connection and the tightness of the housing.

### Cable screening and grounding

If screened cable is necessary, connect the cable screen on both ends to ground potential. In the sensor, the screen must be connected directly to the internal ground terminal. The ground terminal on the outside of the housing must be connected to the potential equalisation (low impedance).

If potential equalisation currents are expected, the connection on the processing side must be made via a ceramic capacitor (e. g. 1 nF, 1500 V). The low-frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.



#### Warning:

Considerable potential differences exist inside galvanic plants as well as vessels with cathodic corrosion protection. Very large equalisation currents can flow through the cable screen when the screen is grounded on both ends. To avoid this, the cable screen must be connected to ground potential only on one end (inside the switching cabinet) in such applications. The cable screen must **not** be connected to the internal ground terminal in the sensor and the outer ground terminal on the housing **not** to potential equalisation!



#### Information:

The metallic parts of the instrument (antenna, transmitter, concentric tube, etc.) are conductively connected with the inner and outer ground terminal on the housing. This connection exists either as a direct metallic contact or via the shielding of the special connection cable on instruments with external electronics. You can find specifications on the potential connections within the instrument in chapter "Technical data".

### Connection cable for Ex applications



Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

### Single/Double chamber housing

## 5.2 Connection procedure

Proceed as follows:

1. Unscrew the housing cover
2. If a display and adjustment module is installed, remove it by turning it to the left.
3. Loosen compression nut of the cable entry
4. Remove approx. 10 cm of the cable mantle, strip approx. 1 cm insulation from the individual wires
5. Insert the cable into the sensor through the cable entry
6. Lift the opening levers of the terminals with a screwdriver (see following illustration)
7. Insert the wire ends into the open terminals according to the wiring plan
8. Press down the opening levers of the terminals, you will hear the terminal spring closing

9. Check the hold of the wires in the terminals by lightly pulling on them
10. Connect the screen to the internal ground terminal, connect the outer ground terminal to potential equalisation
11. Tighten the compression nut of the cable entry. The seal ring must completely encircle the cable
12. Screw the housing cover back on

The electrical connection is hence finished.



Fig. 34: Connection steps 6 and 7

### 5.3 Single chamber housing

#### Electronics and connection compartment

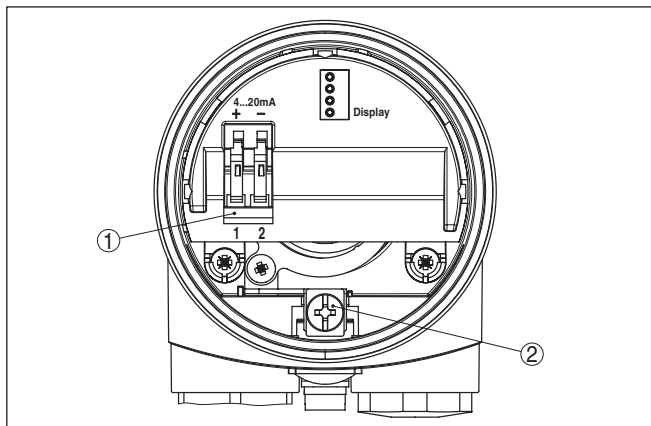


Fig. 35: Electronics and connection compartment, single chamber housing

- 1 Spring-loaded terminals for voltage supply
- 2 Ground terminal for connection of the cable screen

## Wiring plan

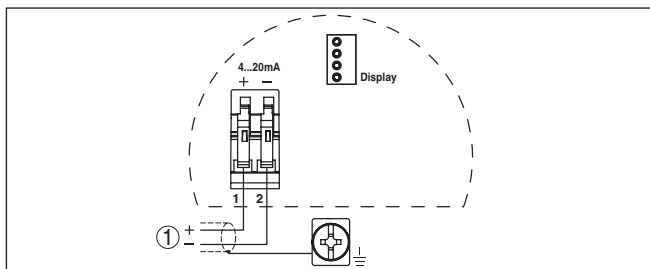


Fig. 36: Wiring plan, single chamber housing

1 Voltage supply/Signal output

## 5.4 Version IP 66/IP 68, 1 bar

## Wire assignment, connection cable

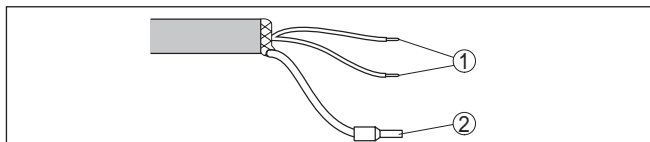


Fig. 37: Wire assignment, connection cable

- 1 brown (+) and blue (-) to power supply or to the processing system
- 2 Shielding

## 5.5 External housing with version IP 68

## Electronics and connection compartment for power supply

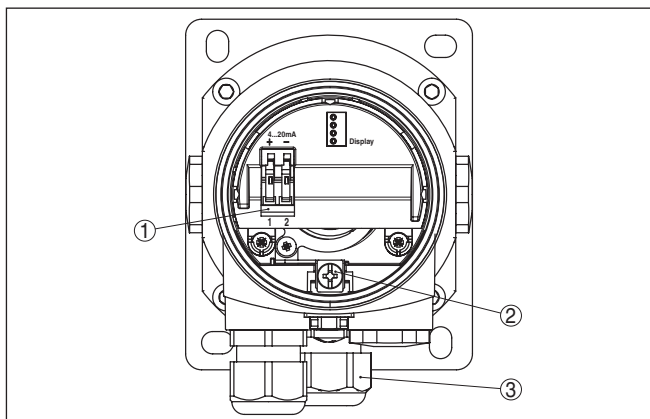


Fig. 38: Electronics and connection compartment

- 1 Spring-loaded terminals for voltage supply
- 2 Ground terminal for connection of the cable screen
- 3 Cable gland to the sensor

### Terminal compartment for sensor connection

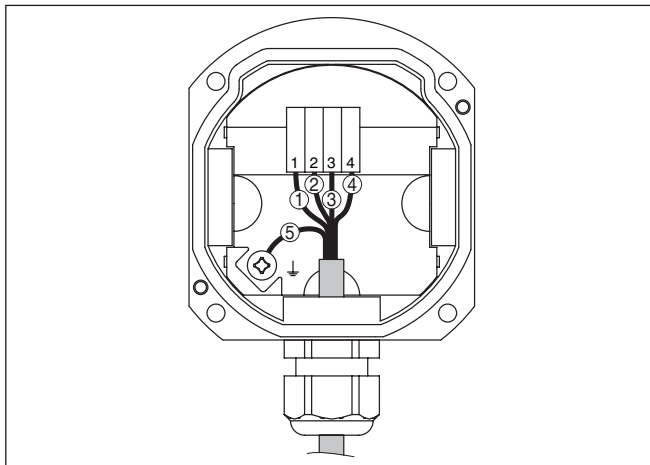


Fig. 39: Connection of the sensor in the housing base

- 1 Brown
- 2 Blue
- 3 Yellow
- 4 White
- 5 Shielding

### Wiring plan external electronics

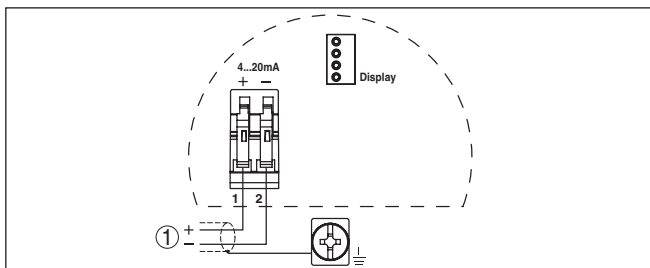


Fig. 40: Wiring plan external electronics

- 1 Voltage supply/Signal output

## 5.6 Switch-on phase

### Switch-on phase

After connecting VEGADIF 65 to power supply or after a voltage recurrence, the instrument carries out a self-check for approx. 30 seconds:

- Internal check of the electronics
- Indication of the instrument type, the firmware as well as the sensor TAGs (sensor designation)
- Output signal jumps briefly (approx. 10 seconds) to the set fault current

Then the corresponding current is outputted to the cable (the value corresponds to the actual level as well as the settings already carried out, e.g. factory setting).

## 6 Adjustment with the display and adjustment module PLICSCOM

### 6.1 Short description

The display and adjustment module is used for measured value display, adjustment and diagnosis. It can be mounted in the following housing versions and instruments:

- All continuously measuring sensors in single as well as double chamber housing (optionally in the electronics or connection compartment)
- External display and adjustment unit



#### Note:

You can find detailed information on the adjustment in the operating instructions manual "*Display and adjustment module*".

### 6.2 Insert display and adjustment module

#### Mount/Dismount display and adjustment module

The display and adjustment module can be inserted into the sensor and removed again at any time. It is not necessary to interrupt the power supply.

Proceed as follows:

1. Unscrew the housing cover
2. Place the display and adjustment module in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)
3. Press the display and adjustment module onto the electronics and turn it to the right until it snaps in.
4. Screw housing cover with inspection window tightly back on

Removal is carried out in reverse order.

The display and adjustment module is powered by the sensor, an additional connection is not necessary.



Fig. 41: Insert display and adjustment module

**Note:**

If you intend to retrofit the instrument with a display and adjustment module for continuous measured value indication, a higher cover with an inspection glass is required.

### 6.3 Adjustment system

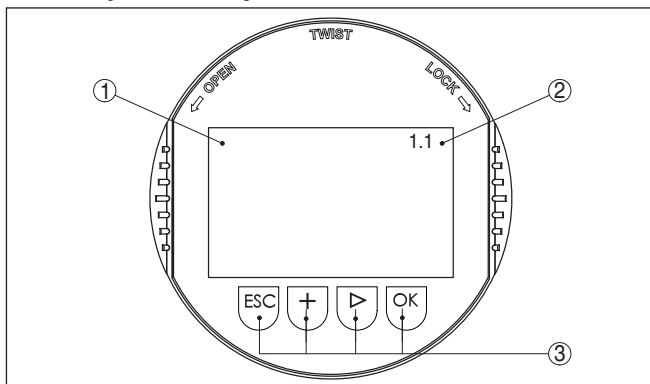


Fig. 42: Display and adjustment elements

- 1 LC display
- 2 Indication of the menu item number
- 3 Adjustment keys

#### Key functions

- **[OK]** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter

- Save value
- **[→]** key to select:
  - Menu change
  - Select list entry
  - Select editing position
- **[+]** key:
  - Change value of the parameter
- **[ESC]** key:
  - interrupt input
  - Jump to next higher menu

## Adjustment system

The sensor is adjusted via the four keys of the display and adjustment module. The LC display indicates the individual menu items. The functions of the individual keys are shown in the above illustration. Approx. 10 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with **[OK]** will not be saved.

## 6.4 Set parameters

### Introduction

VEGADIF 65 has general adjustment parameters which are also used for other measuring principles as well as instrument-specific adjustment parameters. The general adjustment parameters are described in the operating instructions manual "*Display and adjustment module*".

The instrument-specific adjustment parameters are described in this chapter.



#### Information:

If the adjustment limits of the adjustment parameters are exceeded, the message "*Outside parameter limits*" appears. The editing procedure can be aborted with **[ESC]** or the displayed limit value can be accepted with **[OK]**.

### Applications

The VEGADIF 65 can be used for differential pressure, level, flow as well as density and interface measurement. The selection of the respective application is carried out in the menu item "*Application*". Dependent on the selected application, the adjustment is carried out as zero/span or min./max. adjustment.

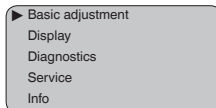


#### Information:

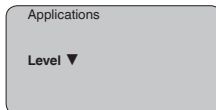
The applications density and interface measurement are also realized via the application level measurement.

Proceed as follows to switch over to the application differential pressure or flow measurement:

1. Push the **[OK]** button in the measured value display, the menu overview is displayed.



2. Confirm the menu "**Basic adjustment**" with **[OK]**.



3. Confirm the menu item "**Application**" with **[OK]**.

**Warning:**

Note the warning: "*Output can change*".

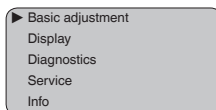
4. Select with **[->]** "**OK**" and confirm with **[OK]**.
5. Select the requested application in the selection list, for example "**Flow**" and confirm with **[OK]**.

**Unit of measurement**

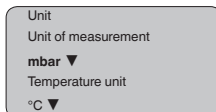
In this menu item you select the adjustment unit as well as the unit for the temperature indication in the display.

To select the adjustment unit (in the example switching over from mbar to bar), proceed as follows:

1. Push the **[OK]** button in the measured value display, the menu overview is displayed.



2. Confirm the menu "**Basic adjustment**" with **[OK]**, the menu item "**Unit**" will be displayed.



3. Activate the selection with **[OK]** and select "**Units of measurement**" with **[->]**.
  4. Activate the selection with **[OK]** and select the requested unit with **[->]** (in the example bar).
  5. Confirm with **[OK]** and move to position correction with **[->]**.
- The adjustment unit is thus switched over from mbar to bar.

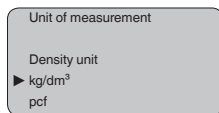
**Information:**

When switching over to adjustment in a height unit (for example for level measurement), the density also has to be entered.

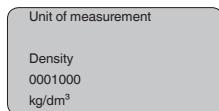
Proceed as follows to enter the density:

1. Push the **[OK]** button in the measured value display, the menu overview is displayed.

2. Confirm the menu "**Basic adjustment**" with **[OK]**, the menu item "**Units of measurement**" will be displayed.
3. Activate the selection with **[OK]** and select the requested unit with **[->]** (in the example m).
4. Confirm with **[OK]**, the submenu "**Density unit**" appears.



5. Select the requested unit, e.g. kg/dm³ with **[->]** and confirm with **[OK]**, the submenu "**Density**" appears.



6. Enter the requested density value with **[->]** and **[+]**, confirm with **[OK]** and move to position correction with **[->]**.

The adjustment unit is thus switched over from bar to m.

Proceed as follows to select the temperature unit:

1. Activate the selection with **[OK]** and select "**Temperature unit**" with **[->]**.
2. Activate the selection with **[OK]** and select the requested unit with **[->]** (e.g. °F).
3. Confirm with **[OK]**.

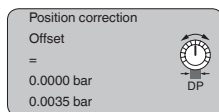
The temperature unit is hence switched over from °C to °F.

## Position correction

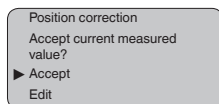
The position correction compensates the influence of the installation position of the instrument on the measured value. In this menu item, the offset value as well as the current measured value are displayed.

Proceed as follows:

1. Activate in the menu item "**Position correction**" the selection with **[OK]**.



2. Select with **[->]**, e.g. to accept the actual measured value 0.0035 bar.



3. Confirm with **[OK]**.

Position correction

Offset  
=  
-0.0035 bar  
0.0000 bar



#### 4. Move to min. (zero) adjustment with **[->]**.

The current measured value was corrected to 0, the corrective value is available in the display as offset value with sign reversal.

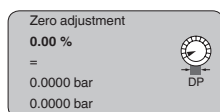
If a known value should be taken over as position correction which is not the current value, then you have to select the function "Edit" and enter the requested value.

### Zero adjustment with differential pressure

In this menu item, the min. differential pressure is entered.

Proceed as follows:

1. Edit the bar value in the menu item "zero" with **[OK]**.



2. Set the requested value with **[+]** and **[->]**.
3. Confirm with **[OK]** and move to span adjustment with **[->]**.

For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

The zero adjustment is finished.



#### Information:

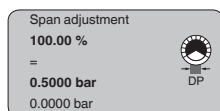
The zero adjustment shifts the value of the span adjustment. The span, i.e. the difference between these values, however, remains unchanged.

### Span adjustment with differential pressure

In this menu item, the max. differential pressure is entered.

Proceed as follows:

1. Edit the bar value in the menu item "span" with **[OK]**.



#### Information:

If the instrument has not yet been adjusted, the displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 500 mbar).

2. Set the requested value with **[+]** and **[->]**.
3. Confirm with **[OK]** and move to the menu overview with **[ESC]**.

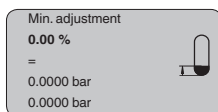
For an adjustment with pressure, simply enter the actual measured value indicated at the bottom of the display.

The span adjustment is finished.

### Min. adjustment with level

Proceed as follows:

1. Edit the % value in the menu item "Min. adjustment" with **[OK]**.



2. Set the requested value with **[+]** and **[->]**.
3. Confirm with **[OK]** and edit the requested bar value.
4. Set the requested bar value with **[+]** and **[->]**.
5. Confirm with **[OK]** and move to max. adjustment with **[->]**.

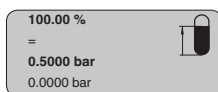
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

The min. adjustment is finished.

### Max. adjustment with level

Proceed as follows:

1. Edit the % value in the menu item "Max. adjustment" with **[OK]**.



#### Information:

If the instrument has not yet been adjusted, the displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 500 mbar).

2. Set the requested value with **[->]** and **[OK]**.
3. Confirm with **[OK]** and edit the requested mbar value.
4. Set the requested value with **[+]** and **[->]**.
5. Confirm with **[OK]** and move to the menu overview with **[ESC]**.

For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

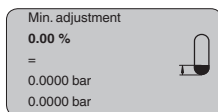
The max. adjustment is finished.

### Min. adjustment with density

For the min. adjustment with density, a filling of the vessel is not necessary. The numeric examples are stated in chapter *Mounting, Measurement setup, Density and interface* of this instructions manual.

Proceed as follows:

1. Edit the % value in the menu item "Min. adjustment" with **[OK]**.



2. Set the requested value with **[+]** and **[->]**, for example 100 %.
3. Confirm with **[OK]** and edit the requested bar value.
4. Set the requested bar value with **[+]** and **[->]**, for example 29.4 mbar.
5. Confirm with **[OK]** and move to max. adjustment with **[->]**.

For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

The min. adjustment is finished.

### Max. adjustment with density

For the max. adjustment with density, a filling of the vessel is not necessary. The numeric examples are stated in chapter *Mounting, Measurement setup, Density and interface* of this instructions manual.

Proceed as follows:

1. Edit the % value in the menu item "Max. adjustment" with **[OK]**.



#### Information:

If the instrument has not yet been adjusted, the displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 100 mbar).

2. Set the requested value with **[->]** and **[OK]**, for example 0.0 %.
3. Confirm with **[OK]** and edit the requested mbar value.
4. Set the requested value with **[+]** and **[->]**, for example 35.3 mbar.
5. Confirm with **[OK]** and move to the menu overview with **[ESC]**.

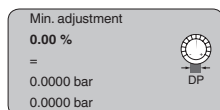
For an adjustment with filling, simply enter the actual measured value indicated at the bottom of the display.

The max. adjustment is finished.

### Min. adjustment with flow

Proceed as follows:

1. Edit the bar value in the menu item "Min. adjustment" with **[OK]**.



2. Set the requested bar value with **[+]** and **[->]**.
3. Confirm with **[+]** and move to max. adjustment with **[->]**.

For an adjustment with flow, simply enter the actual measured value indicated at the bottom of the display.



#### Information:

The VEGADIF 65 is also suitable for bidirectional flow measurement (flow in both directions). The selection is carried out in the menu item "Linearization curve". With the bidirectional flow measurement, the min. adjustment value must be equal to the negative max. adjustment value.

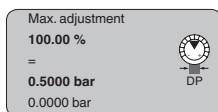
Example: Max. adjustment value **+100 mbar**, as min. adjustment value, **-100 mbar** must hence be entered.

The min. adjustment is finished.

### Max. adjustment with flow

Proceed as follows:

1. Edit the bar value in the menu item "Max. adjustment" with **[OK]**.



### Information:

If the instrument has not yet been adjusted, the displayed pressure for 100 % corresponds to the nominal measuring range of the sensor (in the above example 500 mbar).

2. Set the requested mbar value with **[->]** and **[OK]**.
3. Confirm with **[OK]** and move to the menu overview with **[ESC]**.

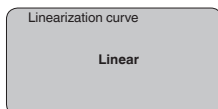
For an adjustment with flow, simply enter the actual measured value indicated at the bottom of the display.

The max. adjustment is finished.

### Linearization curve with level

For level measurement, a linearization is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. in a cylindrical or spherical tank - and the indication or output of the volume is requested.

Respective linearisation curves are stored for these vessels. They indicate the relation between the percentage level and the vessel volume. By activating the suitable curve, the percentage vessel volume is displayed correctly.



Enter the requested parameters via the appropriate keys, save your settings and jump to the next menu item with the **[->]** key.



### Caution:

Note the following if the VEGADIF 65 with corresponding approval is used as part of an overflow protection system according to WHG (Water Resources Act):

If a linearization curve is selected, the measuring signal is no longer linear to the level. This must be taken into consideration by the user, particularly when setting the switching point on the limit signal indicator.

### Leak flow volume suppression with flow

In some application, small flow quantities should not be detected. With the creeping quantity suppression, the flow value can be suppressed up to a certain % value. The default value is 5 % of the max. flow value, corresponding to 0.25 % of the max. differential pressure value. The limit value is 50 %. This function depends on the selected linearization function and is only available with root extracted characteristics.

The square root/bidirectional square root characteristics is very steep at the zero point. This means that small changes in the measured

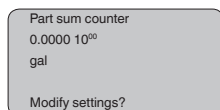
differential pressure cause big changes in the output signal. The leak volume suppression stabilises the signal output.

### Total amounts counter and subtotalizer with flow

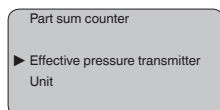
The VEGADIF 65 has two internal totalizers. For both you can adjust volume or mass as count function as well as separately the unit.

Proceed as follows:

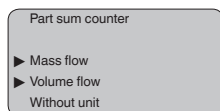
1. Select, for example, menu item "*Part sum counter*".



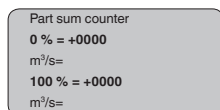
2. Activate the function "*Modify settings?*" with **[OK]**.



3. Confirm with **[OK]** "*Effective pressure transmitter*".



4. Select the requested variable with **[->]** and confirm with **[OK]**.
5. Select calibration unit of the effective pressure transmitter with **[->]**, for example m<sup>3</sup>/s and confirm with **[OK]**.



6. Edit with **[OK]** and set the requested values with **[+]** and **[->]**.
7. Confirm with **[OK]** and jump back to the indication of the part sum counter.
8. Select with **[->]** the unit of the sum counter, adjust the requested unit with **[->]**, for example m<sup>3</sup>/s and confirm with **[OK]**.

The setting of the part sum counter is hence terminated, the counting function is activated.

The procedure of the total sum counter is the same.

### Copy sensor data

This function enables uploading parameter adjustment data into the display and adjustment module as well as downloading parameter adjustment data into the sensor. A detailed description of the function is available in the operating instructions manual "*Display and adjustment module*".

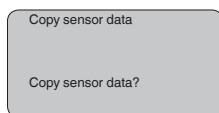
The following data are loaded or downloaded with this function:

- Measured value presentation
- Applications
- Adjustment

- Damping
- Linearization curve
- Leak flow volume suppression
- Sensor-TAG
- Displayed value
- Display unit
- Scaling
- Current output
- Unit of measurement
- Language

The following safety-relevant data are **not** uploaded or downloaded:

- HART mode
- PIN



### Reset

#### Basic adjustment

The reset "*Basic adjustment*" resets the values of the following menu items to the reset values (see chart):

Menu section	Menu item	Reset value
Basic settings	Zero/Min. adjustment	Measuring range begin
	Span/Max. adjustment	Measuring range end
	Density	1 kg/l
	Density unit	kg/l
	Damping	1 s
	Linearization	Linear
	Sensor-TAG	Sensor
Display	Displayed value	Differential pressure
	Display unit	Mass/kg
	Scaling	0.00 to 100.0
	Decimal point indication	8888.8
Diagnostics	Totalizer	0.0000 10 <sup>00</sup> gal
	Part sum counter	0.0000 10 <sup>00</sup> gal
Service	Current output - characteristics	4 ... 20 mA
	Current output - failure mode	< 3.6 mA
	Current output - min. current	3.8 mA
	Current output - max. current	20.5 mA

The values of the following menu items are *not* reset with "**Reset**":

Menu section	Menu item	Reset value
Basic settings	Unit of measurement	bar
	Temperature unit	°C
	Position correction	No reset
Display	Backlight	No reset
Service	Language	No reset
	Applications	No reset

### Peak value

The min. and max. temperature or pressure values are each reset to the actual value.

### Totalizer

The total and part sum counter are reset to zero.

## Optional settings

Additional adjustment and diagnosis options such as e.g. scaling, simulation or trend curve presentation are shown in the following menu schematic. You will find a detailed description of these menu items in the operating instructions manual "*Display and adjustment module*".

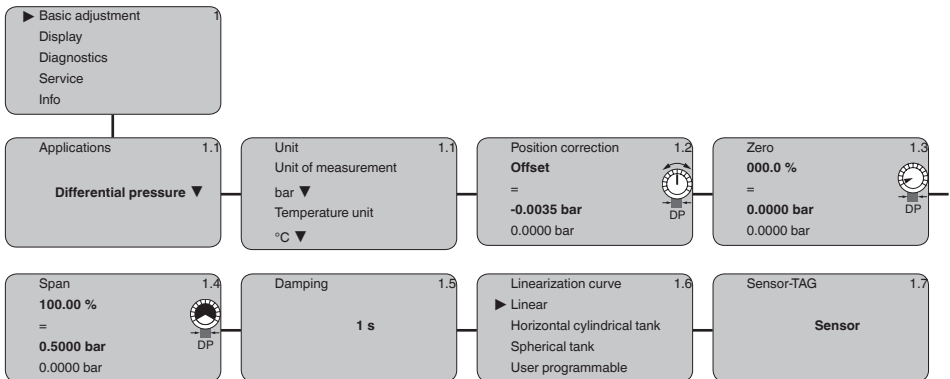
## 6.5 Menu schematic



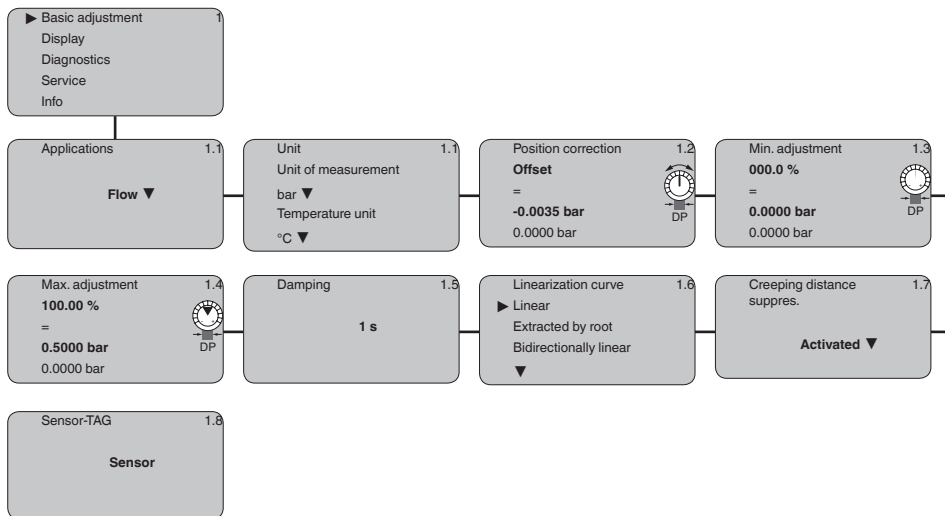
### Information:

Depending on the version and application, the highlighted menu windows may not always be available.

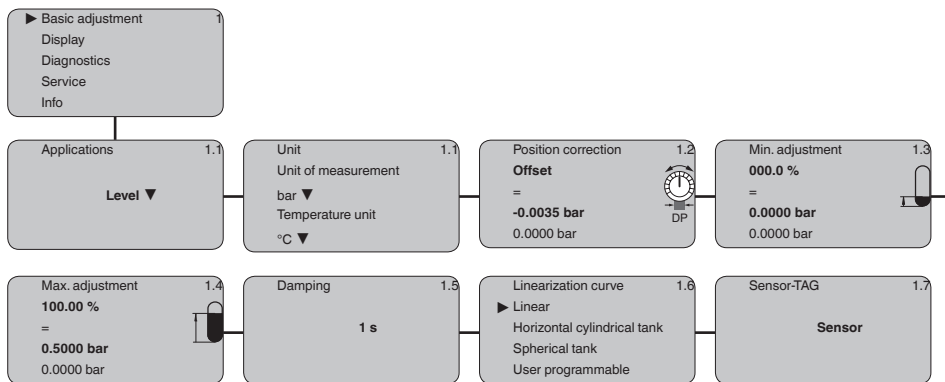
### Basic adjustment differential pressure



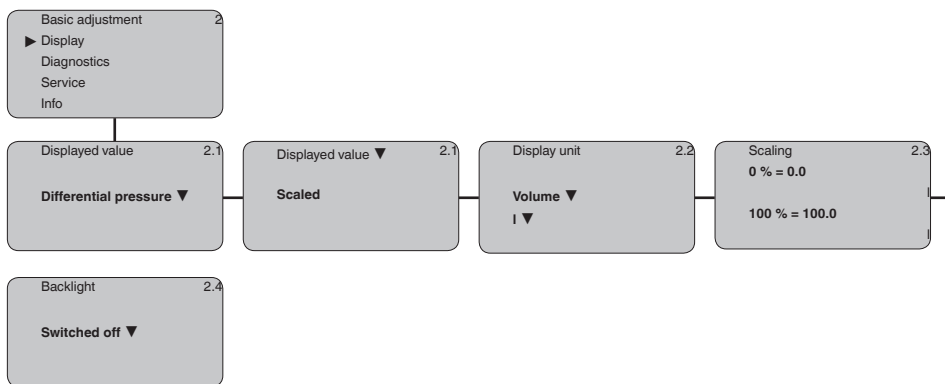
### Basic adjustment flow



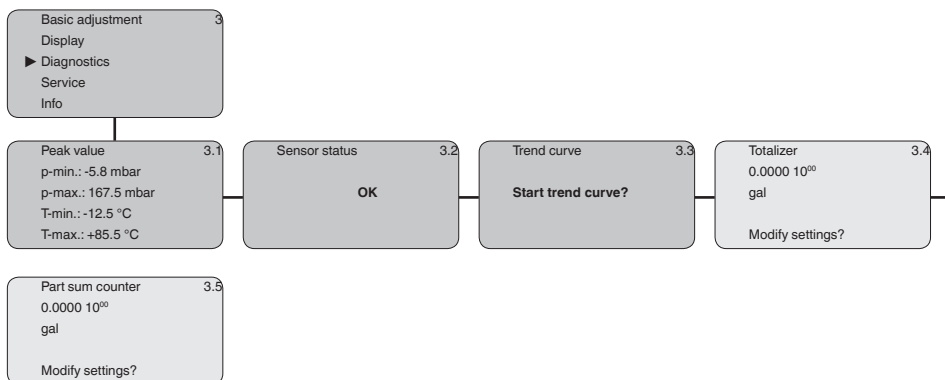
### Basic setting level



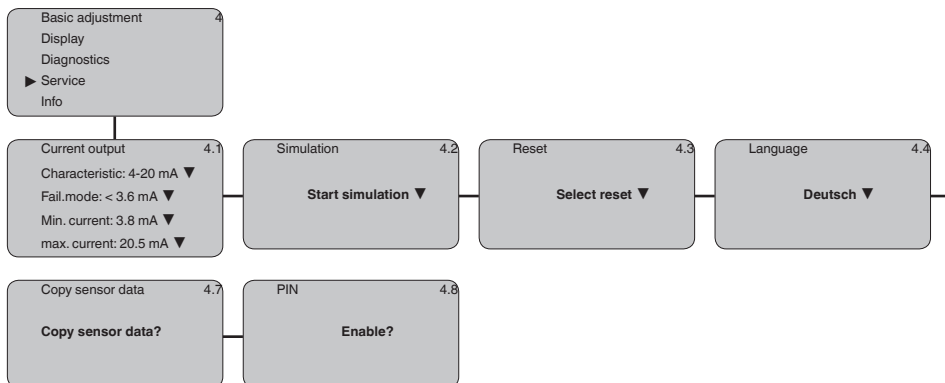
## Display



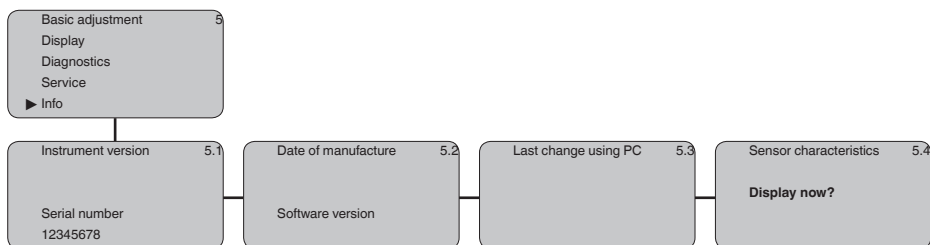
## Diagnostics



## Service



## Info



## 6.12 Saving the parameter adjustment data

We recommended noting the adjusted data, e.g. in this operating instructions manual, and archiving them afterwards. They are thus available for multiple use or service purposes.

If VEGADIF 65 is equipped with a display and adjustment module, the most important data can be read out of the sensor into the display and adjustment module. The procedure is described in the operating instructions manual "*Display and adjustment module*" in the menu item "*Copy sensor data*". The data remain there permanently even if the sensor power supply fails.

If it is necessary to exchange the sensor, the display and adjustment module is inserted into the replacement instrument and the data are written into the sensor under the menu item "*Copy sensor data*".

## 7 Setup

### 7.1 Select the mode

The following operating modes can be set on VEGADIF 65:

- Flow measurement
- Level measurement
- Differential pressure measurement

### 7.2 Flow measurement

#### Instructions

In flow measurement, VEGADIF 65 is normally used without a chemical seal.

Before adjusting VEGADIF 65, you have to clean the effective pressure lines and the instrument must be filled with the medium.

#### Measurement setup for gases

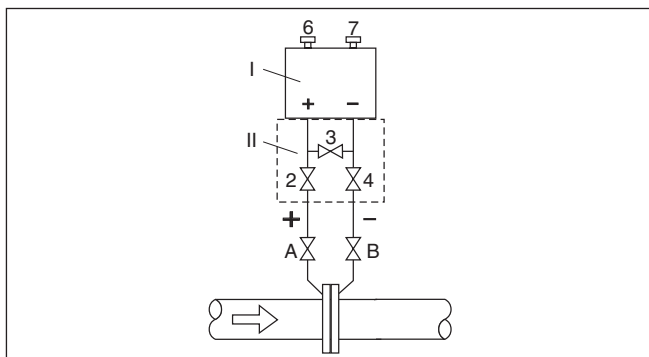


Fig. 43: Preferred measurement setup for gases

- I VEGADIF 65
- II 3-fold valve block
- 2,4 Inlet valves
- 3 Breather valve
- 6,7 Vent valves on VEGADIF 65
- A, B Blocking valves

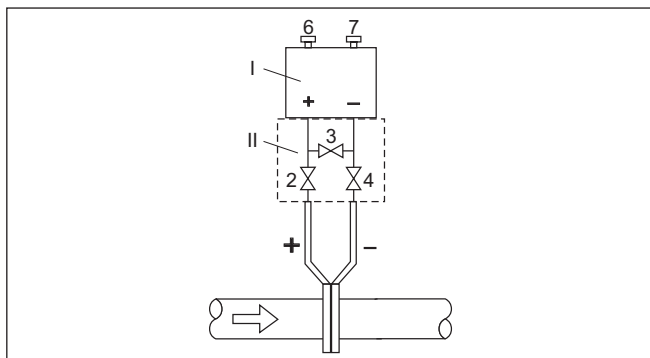


Fig. 44: Preferred measurement setup for gases, connection via 3-fold valve block, flanging on both sides

- I VEGADIF 65
- II 3-fold valve block
- 2.4 Inlet valves
- 3 Breather valve
- 6.7 Vent valves on VEGADIF 65

## Measurement setup for liquids

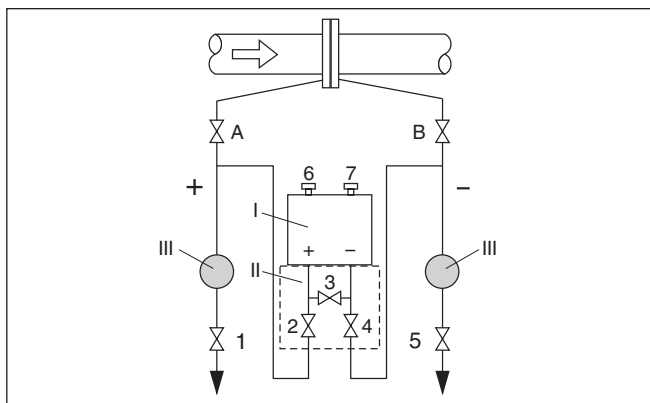


Fig. 45: Preferred measurement setup for liquids

- I VEGADIF 65
- II 3-fold valve block
- III Separator
- 1.5 Drain valves
- 2.4 Inlet valves
- 3 Breather valve
- 6.7 Vent valves on VEGADIF 65
- A, B Blocking valves

## Prepare the adjustment

Proceed as follows:

1. Close valve 3
2. Fill measuring system with medium.

For this purpose, open valves A, B (if available) as well as 2, 4:  
Medium flows in

If necessary, clean the differential pressure lines: - with gases by blowing out with compressed air - with liquids by rinsing.<sup>1)</sup>

For this purpose close valve 2 and 4, i.e. block the instrument.

Then open valve 1 and 5 so that the effective pressure lines blow out/rinse.

Close valves 1 and 5 (if available) after cleaning

3. Remove air from instrument:

Open valves 2 and 4: Medium flows in

Close valve 4: Minus side is closed

Open valve 3: Equalisation plus and minus side

Briefly open valve 6 and 7, then close again: Fill the measuring instrument completely with the medium and remove air

4. Carry out a position correction if the following conditions apply. If the conditions are not fulfilled, then carry out the position correction after step 6.

Conditions:

The process cannot be sealed off.

The pressure extraction points (A and B) are at the same geodesic height.

5. Put measurement loop into operation:

Close valve 3: Separate plus and minus side

Open valve 4: Connect minus side

Now:

Valves 1, 3, 5, 6 and 7 are closed<sup>2)</sup>

Valves 2 and 4 are open

Valves A and B open

6. Carry out position correction, if flow can be blocked. In this case, step 5 is not required.

Then carry out adjustment, see chapter "*Set parameters*".

### 7.3 Level measurement

#### Instructions

For level measurements, all versions of VEGADIF 65 are employed. VEGADIF 65 with double chemical seal is immediately ready for operation.

The VEGADIF 65 without chemical seal or with single chemical seal is ready for operation after opening a blocking valve, in case one is present.

Before you adjust VEGADIF 65 without chemical seal or with single chemical seal, the effective pressure lines must be cleaned and the instrument filled with the medium.

<sup>1)</sup> Arrangement with 5 valves.

<sup>2)</sup> Valves 1, 3, 5: Configuration with 5 valves.

## Measurement setup for open vessels

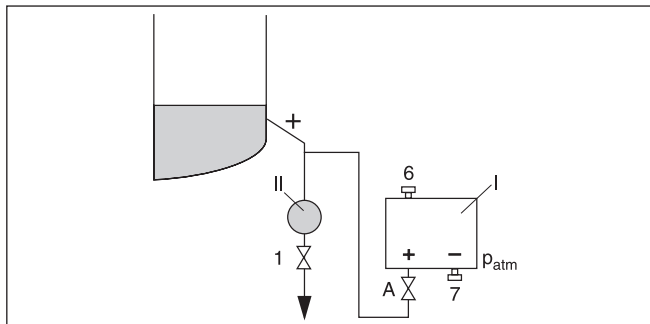


Fig. 46: Preferred measurement setup for open vessels

I VEGADIF 65

II Separator

1 Drain valve

6.7 Vent valves on VEGADIF 65

A Blocking valve

## Prepare the adjustment

Proceed as follows:

1. Fill the vessel to just over the lower tap.
2. Fill measuring system with medium.  
Open valve A: Medium flows in.
3. Vent instrument  
Briefly open valve 6, then close it: Fill the measuring instrument completely with the medium and remove air.
4. Set measurement loop to operation

Now:

Valve A open and valve 6 closed

Then carry out adjustment, see below.

## Measurement setup for closed vessels

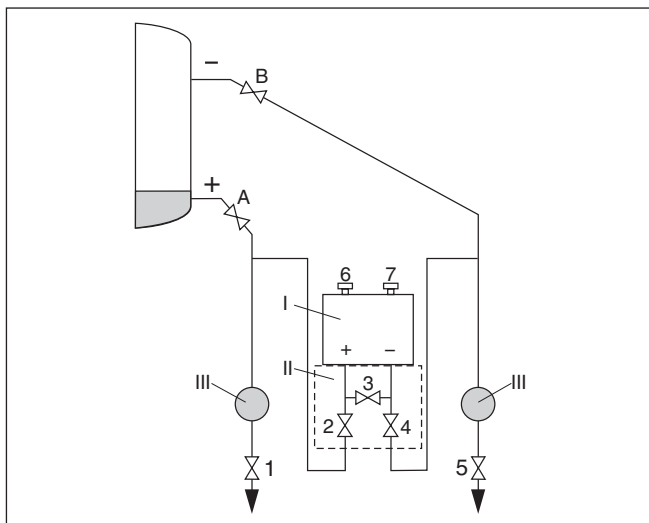


Fig. 47: Preferred measurement setup for closed vessels

- I VEGADIF 65
- II 3-fold valve block
- III Separator
- 1, 5 Drain valves
- 2, 4 Inlet valves
- 6, 7 Vent valves on VEGADIF 65
- A, B Blocking valves

## Prepare the adjustment

Proceed as follows:

1. Fill the vessel to just above the lower tap
2. Fill measuring system with medium  
Close valve 3: Separate plus and minus side  
Open valve A and B: Open block valves
3. Vent plus side (probably empty minus side)  
Open valve 2 and 4: Discharge medium on the plus side  
Briefly open valve 6 and 7, then close again: Fill the plus side completely with the medium and remove air.
4. Set measurement loop to operation  
Now:  
Valve 3, 6 and 7 are closed  
Valves 2, 4, A and B are open  
Then carry out adjustment, see below.

## Measurement setup for closed vessels with steam overlay

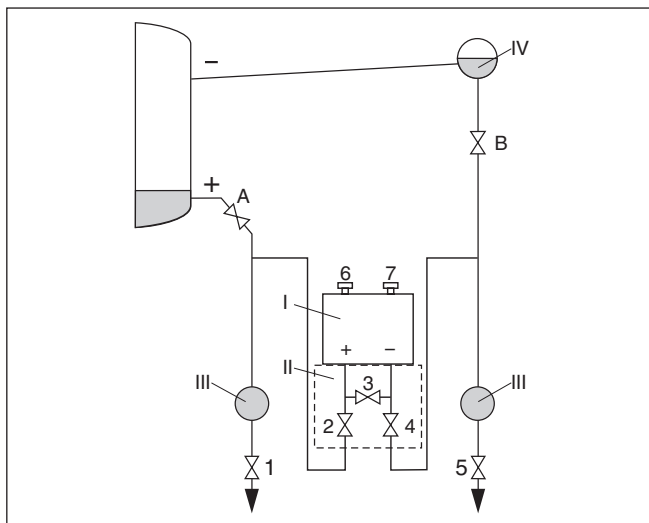


Fig. 48: Preferred measurement setup for closed vessels with steam overlay

- I VEGADIF 65
- II 3-fold valve block
- III Separator
- IV Condensate vessel
- 1, 5 Drain valves
- 2, 4 Inlet valves
- 3 Breather valve
- 6, 7 Vent valves on VEGADIF 65
- A, B Blocking valves

## Prepare the adjustment

Proceed as follows:

1. Fill the vessel to just above the lower tap
2. Fill measuring system with medium  
Open valve A and B: Open block valves  
Fill the minus effective pressure line on the height of the condensation pot
3. Remove air from instrument:  
Open valve 2 and 4: Discharge medium  
Open valve 3: Equalisation plus and minus side  
Briefly open valve 6 and 7, then close again: Fill the measuring instrument completely with the medium and remove air
4. Put measurement loop into operation:  
Close valve 3: Separate plus and minus side  
Open valve 4: Connect minus side  
Now:  
Valve 3, 6 and 7 are closed  
Valves 2, 4, A and B are open.

Then carry out adjustment, see chapter "Set parameters".

## 7.4 Density and interface measurement

For density and interface measurements, VEGADIF 65 with double chemical seal is used.

VEGADIF 65 in this version is immediately ready for operation.

## 7.5 Differential pressure measurement

For differential pressure measurements, VEGADIF 65 without chemical seal or with double chemical seal is used.

VEGADIF 65 with double chemical seal is immediately ready for operation.

Before adjusting VEGADIF 65 without chemical seal, the effective pressure lines must be cleaned and the instrument filled with medium.

### Instructions

### Measurement setup for gases

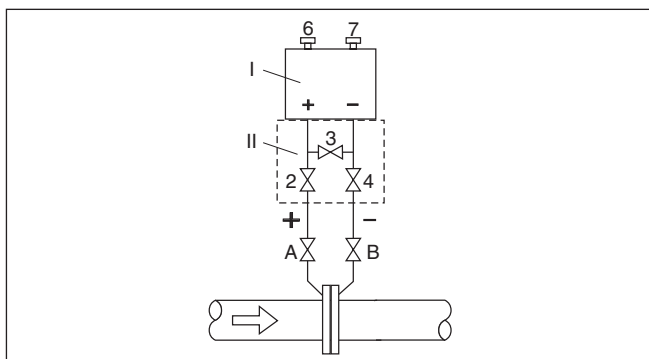


Fig. 49: Preferred measurment setup for gases

- I VEGADIF 65
- II 3-fold valve block
- 2, 4 Inlet valves
- 3 Breather valve
- 6, 7 Vent valves on VEGADIF 65
- A, B Blocking valves

## Measurement setup for liquids

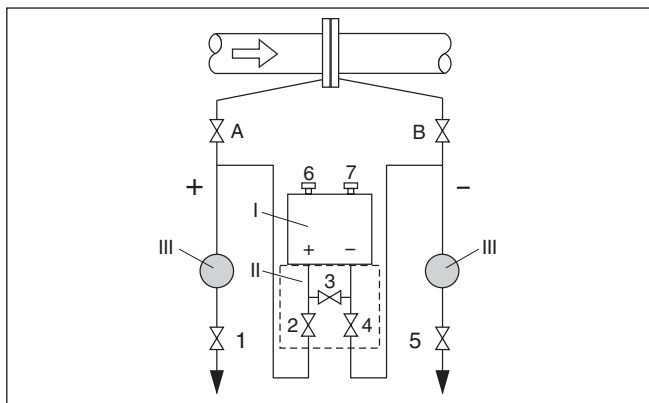


Fig. 50: Preferred measurement setup for liquids

- I VEGADIF 65
- II 3-fold valve block
- III Separator
- 1.5 Drain valves
- 2.4 Inlet valves
- 3 Breather valve
- 6, 7 Vent valves on VEGADIF 65
- A, B Blocking valves

## Prepare the adjustment

Proceed as follows:

1. Close valve 3
2. Fill measuring system with medium.  
Open valves A, B, 2, 4: Medium flows in.  
If necessary, clean the differential pressure lines: - with gases by blowing out with compressed air - with liquids by rinsing.<sup>3)</sup>  
Close valve 2 and 4, block the instrument  
Open valve 1 and 5  
Close valve 1 and 5
3. Remove air from instrument:  
Open valves 2 and 4: Medium flows in  
Close valve 4: Minus side is closed  
Open valve 3: Equalisation plus and minus side  
Briefly open valve 6 and 7, then close again: Fill the measuring instrument completely with the medium and remove air
4. Put measurement loop into operation:  
Close valve 3: Separate plus and minus side  
Open valve 4: Connect minus side  
Now:  
Valves 1, 3, 5, 6 and 7 are closed<sup>4)</sup>

<sup>3)</sup> Arrangement with 5 valves.

<sup>4)</sup> Valves 1, 3, 5: Configuration with 5 valves.

Valves 2 and 4 are open

Valves A and B open (if present)

Then carry out adjustment, see chapter "*Set parameters*".

## 8 Maintenance and fault rectification

### 8.1 Maintenance

#### Maintenance

If the instrument is used properly, no special maintenance is required in normal operation.

In some applications, product buildup on the separating diaphragms can influence the measuring result. Depending on the sensor and application, take precautions to ensure that heavy buildup, and especially a hardening thereof, is avoided.

### 8.2 Rectify faults

#### Reaction when malfunctions occur

The operator of the system is responsible for taking suitable measures to rectify faults.

#### Failure reasons

VEGADIF 65 offers maximum reliability. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Voltage supply
- Signal processing

#### Fault rectification

The first measures to be taken are to check the output signals as well as to evaluate the error messages via the display and adjustment module. The procedure is described below. Further comprehensive diagnostics can be carried out on a PC with the software PACTware and the suitable DTM. In many cases, the causes can be determined and the faults rectified this way.

#### 24 hour service hotline

Should these measures not be successful, please call in urgent cases the VEGA service hotline under the phone no. **+49 1805 858550**.

The hotline is available to you 7 days a week round-the-clock. Since we offer this service world-wide, the support is only available in the English language. The service is free of charge, only the standard telephone costs will be charged.

#### Check the 4 ... 20 mA signal

Connect a handheld multimeter in the suitable measuring range according to the wiring plan.

Error code	Cause	Rectification
4 ... 20 mA signal not stable	Level fluctuations	– Set the integration time via the display and adjustment module or PACTware

Error code	Cause	Rectification
4 ... 20 mA signal missing	Wrong connection to voltage supply	– Check connection according to chapter " <i>Connection steps</i> " and if necessary, correct according to chapter " <i>Wiring plan</i> "
	No power supply	– Check cables for breaks; repair if necessary
	Operating voltage too low or load resistance too high	– Check, adapt if necessary
Current signal greater than 22 mA or less than 3.6 mA	Electronics module or measuring cell defective	– Exchange the instrument or send it in for repair



#### Error messages via the display and adjustment module

In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

Error code	Cause	Rectification
E013	no measured value available <sup>5)</sup>	– Exchange the instrument or send it in for repair
E017	Adjustment span too small	– repeat with modified values
E036	no operable sensor software	– Carry out a software update or send instrument for repair
E041	Hardware error	– Exchange the instrument or send it in for repair

#### Reaction after fault rectification

Depending on the reason for the fault and the measures taken, the steps described in chapter "*Set up*" may have to be carried out again.

### 8.3 Exchanging the electronics module

In case of a defect, the electronics module can be exchanged against an identical type by the user. If no electronics module is available on site, the module can be ordered from the agency serving you.



In Ex applications only one instrument and one electronics module with respective Ex approval may be used.

The sensor serial number is required to order an exchange electronics. You will find this number on the type label of the instrument or on the delivery note.

### 8.4 Software update

The software version of VEGADIF 65 can be determined as follows:

- on the type label of the electronics
- Via the display and adjustment module
- via PACTware

<sup>5)</sup> Fault message can also appear if the pressure is higher than the nominal range.

You can view all software histories on our website [www.vega.com](http://www.vega.com). Make use of this advantage and get registered for update information via e-mail.

The following components are required to update the sensor software:

- Sensor
- Voltage supply
- VEGACONNECT
- PC with PACTware
- Current sensor software as file

#### Load sensor software to PC

At "[www.vega.com/downloads](http://www.vega.com/downloads)" go to "*Software*". Select under "*plics sensors and instruments*", "*Firmware updates*" the respective instrument series and software version. Load the zip file via the right mouse key with "*Save target as*" e.g. on the desktop of your PC. Move with the right mouse key to the folder and select "*Extract all*". Save the extracted files, for example on the desktop.

#### Prepare update

Connect the signal conditioning instrument to power supply and provide the connection from the PC to the instrument via the interface adapter. Start PACTware and go via the menu "*Project*" to the *VEGA project assistant*. Select "*USB*" and "*Set instruments online*". Activate the project assistant with "*Start*". The assistant establishes the connection automatically and opens the parameter adjustment window "*Sensor # online parameter adjustment*". Connect this parameter adjustment window before you carry out further steps.

#### Load software into sensor

Select with the right mouse key the sensor in the project and go to "*Additional function*". Then click to "*Software update*". The window "*Sensor # software update*" opens. PACTware checks now the sensor data and displays the actual hardware and software version of the sensor. This takes approximately 60 s.

Push the button "*Update software*" and select the previously extracted hex file. Then the software update can be started. The additional files are installed automatically. Depending on the sensor, this procedure can last up to 1 h. Then the message appears "*Software update successfully executed*".

### 8.5 Instrument repair

If a repair is necessary, please proceed as follows:

You can download a return form (23 KB) from our Internet homepage [www.vega.com](http://www.vega.com) under: "*Downloads - Forms and certificates - Repair form*".

By doing this you help us carry out the repair quickly and without having to call back for needed information.

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and, if need be, also a safety data sheet outside on the packaging

- Please ask the agency serving you for the address of your return shipment. You can find the respective contact data on our website [www.vega.com](http://www.vega.com) under: "*Company - VEGA worldwide*"

## 9 Dismounting

### 9.1 Dismounting steps

**Warning:**

Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

### 9.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the parts to be easily separable.

**WEEE directive 2002/96/EG**

This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws. Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects on humans and the environment and ensures recycling of useful raw materials.

Materials: see chapter "*Technical data*"

If you have no way to dispose of the old instrument properly, please contact us concerning return and disposal.

## 10 Supplement

### 10.1 Technical data

## General data

Pressure type	Differential pressure
Measuring principle	Piezoresistive
Communication interface	None

## Materials and weights

Material 316L corresponds to stainless steel 1.4404 or 1.4435

### Materials, wetted parts

- |  |  |
|--|--|
| - Process fitting with lateral flanges | C22.8, 316L, Alloy C276  |
| - Separating diaphragm                 | 316L, Alloy C-276, Tantalum, Rhodium-Gold-Alloy coated   |
| - Seal                                 | FKM, FKM cleaned, FKM for oxygen application, FFKM (Kalrez 6375), EPDM, NBR, copper, copper for oxygen application |
| - Screw plugs                          | 316L   |

Internal transmission liquid

- |                         |                               |
|-------------------------|-------------------------------|
| - Standard applications | Synthetic oil                 |
| - Oxygen applications   | Halocarbon oil <sup>(6)</sup> |

### Materials, non-wetted parts

- |   |   |
|---|---|
| – Electronics housing   | Plastic PBT (polyester), Alu die-casting powder-coated, 316L  |
| – External housing  | plastic PBT (Polyester), 316L   |
| – Socket, wall mounting plate external electronics housing              | plastic PBT (Polyester)   |
| – Seal between housing socket and wall mounting plate                   | TPE (fixed connected)   |
| – Seal ring, housing cover  | Silicone (Aluminium/plastic housing), NBR (stainless steel housing)   |
| – Inspection window in housing cover for display and adjustment module  | Polycarbonate (UL-746-C listed)   |
| – Screws and nuts for lateral flange                                    | PN 160: Hexagon screw DIN 931 M12 x 90 A4 70, hexagon nut DIN 934 M12 A4 70<br>PN 420: Hexagon screw ISO 4014 M12 x 90 A4, hexagon nut ISO 4032 M12 A4 bs |
| – Ground terminal   | 316Ti/316L  |
| – Connection between IP 68 transmitter and external electronics housing | PUR   |
| – Type label support with IP 68 version on cable                        | PE hard   |

Ohmic contact	Between ground terminal and process fitting
---------------	---

<sup>6)</sup> Not with vacuum and absolute pressure measuring ranges < 1 bar<sub>abs</sub>

Max. torque screws mounting strap	30 Nm
Max. torque screws socket external housing	5 Nm (3.688 lbf ft)
Weight approx.	4.2 ... 4.5 kg (9.26 ... 9.92 lbs), depending on process fitting

### Output variable

Output signal	4 ... 20 mA
Signal resolution	1.6 $\mu$ A
Failure signal output current	mA value unchanged 20.5 mA, 22 mA, < 3.6 mA (adjustable)
Max. output current	22 mA
Load	see load diagram under Power supply
Met NAMUR recommendation	NE 43

### Dynamic behaviour output

Run-up time	$\leq 20$ s
-------------	-------------

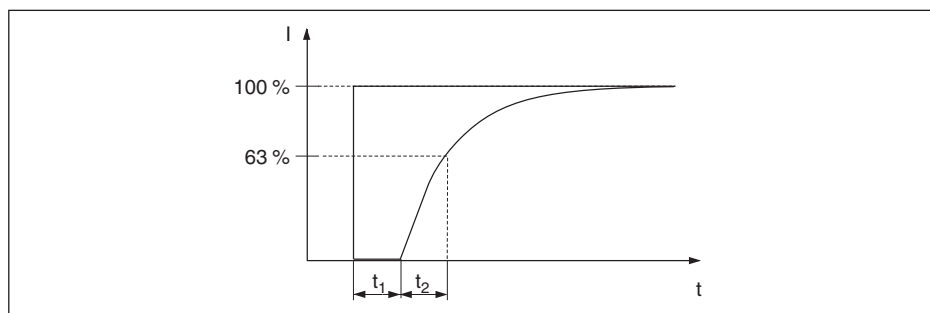


Fig. 51: Presentation of the dead time  $t_1$  and the time constant  $t_2$

The following specified total dead time applies to the 4 ... 20 mA current output:

Version, nominal measuring range	Dead time $t_1$	Time constant $t_2$
Basic version 10 bar and 30 bar	100 ms	250 ms
Basic version 100 mbar	100 ms	180 ms
Basic version 500 mbar	100 ms	180 ms
Basic version, 3 bar	100 ms	180 ms
Basic version 16 bar and 40 bar	100 ms	180 ms
Chemical seal version, all nominal measuring ranges	Dependent on the chemical seal	Dependent on the chemical seal

Damping (63 % of the input variable)	0 ... 999 s, adjustable
--------------------------------------	-------------------------

### Input variable

Measured variable	Differential pressure, flow and level derived from it
Adjustment differential pressure	

Adjustment range of the zero/span adjustment relating to the nominal measuring range:

- Pressure value zero -120 ... +120 %
- Pressure value span zero + (-220 ... +220 %) <sup>7)</sup>

### Adjustment level

Adjustment range of the min./max. adjustment relating to the nominal measuring range:

- Percentage value -10 ... +110 %
- Pressure value -120 ... +120 % <sup>8)</sup>

### Adjustment flow

Adjustment range of the zero/span adjustment relating to the nominal measuring range:

- Pressure value zero -120 ... +120 %
- Pressure value span -120 ... +120 % <sup>9)</sup>

Recommended max. turn down 15 : 1 (no limitation)

### Nominal measuring ranges, measurement limits and smallest spans to be calibrated

Nominal range	Lower measurement limit	Upper measuring limit	Smallest adjustable span
10 mbar (1 kPa)	-10 mbar (-1 kPa)	+10 mbar (+1 kPa)	0.25 mbar (25 Pa)
30 mbar (3 kPa)	-30 mbar (-3 kPa)	+30 mbar (+3 kPa)	0.3 mbar (30 Pa)
100 mbar (10 kPa)	-100 mbar (-10 kPa)	+100 mbar (+10 kPa)	1 mbar (100 Pa)
500 mbar (50 kPa)	-500 mbar (-50 kPa)	+500 mbar (+50 kPa)	5 mbar (500 Pa)
3 bar (300 kPa)	-3 bar (-300 kPa)	+3 bar (+300 kPa)	30 mbar (3 kPa)
16 bar (1600 kPa)	-16 bar (-1600 kPa)	+16 bar (+1600 kPa)	160 mbar (16 kPa)
40 bar (4000 kPa)	-40 bar (-4000 kPa)	+40 bar (+4000 kPa)	400 mbar (40 kPa)

### Reference conditions and actuating variables (according to DIN EN 60770-1)

Reference conditions according to DIN EN 61298-1

- Temperature +18 ... +30 °C (+64 ... +86 °F)
- Relative humidity 45 ... 75 %
- Air pressure 860 ... 1060 mbar/86 ... 106 kPa (12.5 ... 15.4 psig)

Determination of characteristics Limit point adjustment according to IEC 61298-2

Characteristic curve Linear

Calibration position of the measuring cell Vertical, i.e. upright process component

Influence of the installation position to the zero point  $\leq 4 \text{ mbar}^{10)11)}$

A position-dependent zero-point shift can be corrected (see also chapter "Adjust parameter").

Position of the span in the measuring range Based on the zero point

Diaphragm material 316L, Alloy C276, gold rhodium plated, Monel

<sup>7)</sup> Values less than -1 bar cannot be set.

<sup>8)</sup> Values less than -1 bar cannot be set.

<sup>9)</sup> Values less than -1 bar cannot be set.

<sup>10)</sup> Max. value with horizontal process component. Specification applies to the basic version without chemical seal. The value doubles with instruments with inert oil.

<sup>11)</sup>

Filling oil	Silicone oil
Material, lateral flanges	316L

A position-dependent zero-point shift can be corrected (see also chapter "Adjust parameter").

---

#### Deviation determined according to the limit point method according to IEC 60770<sup>12)</sup>

---

Applies to **digital** interfaces (HART, Profibus PA, Foundation Fieldbus) as well as to **analogue** current output 4 ... 20 mA. Specifications refer to the set span. Turn down (TD) is the ratio nominal measuring range/set span.

#### Deviation - All versions

The following applies to square root extracted characteristics: The accuracy data of VEGADIF 65 are entered with factor 0.5 in the accuracy calculation of the flow.

#### Deviation - Basic version

10 mbar, 30 mbar measuring cell

- Turn down 1 : 1  $\pm 0.15$  % of the set span
- Turn down > 1 : 1  $\pm 0.15$  % of the set span x TD

100 mbar measuring cell

- Turn down 1 : 1 to 4 : 1  $\pm 0.075$  % of the set span
- Turn down > 4 : 1  $\pm (0.012 \times TD + 0.027)$  % of the set span

Measuring cells  $\geq 500$  mbar

- Turn down 1 : 1 to 15 : 1  $\pm 0.075$  % of the set span
- Turn down > 15 : 1  $\pm (0.0015 \times TD + 0.053)$  % of the set span

#### Deviation - Chemical seal versions

100 mbar measuring cell

- Turn down 1 : 1 to 4 : 1  $\pm 0.075$  % of the set span + influence of the chemical seal
- Turn down > 4 : 1  $\pm (0.012 \times TD + 0.027)$  % of the set span + influence of the chemical seal

Measuring cells  $\geq 500$  mbar

- Turn down 1 : 1 to 15 : 1  $\pm 0.075$  % of the set span + influence of the chemical seal
- Turn down > 15 : 1  $\pm (0.0015 \times TD + 0.053 \%)$  of the set span + influence of the chemical seal

---

#### Influence of the product or ambient temperature

---

Applies to instruments in basic version with **digital** signal output (HART, Profibus PA, Foundation Fieldbus) as well as to instruments with **analogue** current output 4 ... 20 mA. Specifications refer to the set span. Turn down (TD) = nominal measuring range/set span.

<sup>12)</sup> Incl. non-linearity, hysteresis and non-repeatability.

Temperature range	Measuring range	Thermal changes of the zero signal and the output span relating to the adjusted span
-10 ... +60 °C (+14 ... +140 °F)	10 mbar, 30 mbar	$\pm(0.31 \times \text{TD} + 0.06) \%$
	100 mbar	$\pm(0.18 \times \text{TD} + 0.02) \%$
	500 mbar, 3 bar	$\pm(0.08 \times \text{TD} + 0.05) \%$
	16 bar	$\pm(0.1 \times \text{TD} + 0.1) \%$
	16 bar	$\pm(0.08 \times \text{TD} + 0.05) \%$
-40 ... +10 °C (-40 ... +50 °F) +60 ... +85 °C (+140 ... +185 °F)	10 mbar, 30 mbar	$\pm(0.45 \times \text{TD} + 0.1) \%$
	100 mbar	$\pm(0.3 \times \text{TD} + 0.15) \%$
	500 mbar, 3 bar	$\pm(0.12 \times \text{TD} + 0.1) \%$
	16 bar	$\pm(0.15 \times \text{TD} + 0.2) \%$
	40 bar	$\pm(0.37 \times \text{TD} + 0.1) \%$

Applies also to instruments with **analogue** 4 ... 20 mA current output and refers to the set span.  
Thermal change, current output < 0.05 %/10 K, max. < 0.15 %, each with -40 ... +80 °C (-40 ... +176 °F)

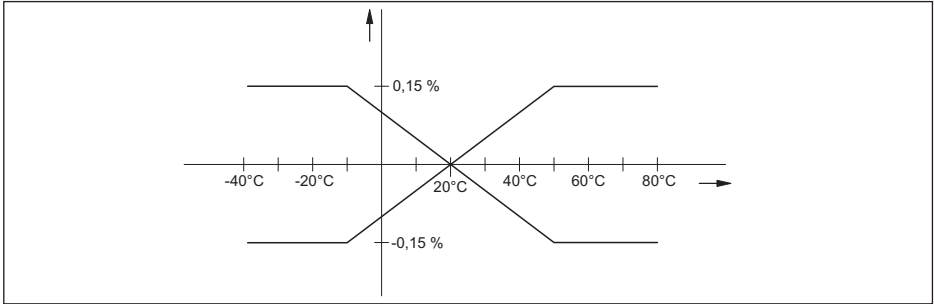


Fig. 52: Thermal change, current output

**Influence of the system pressure on the zero point and span**

**316L, Alloy C276-, Alloy C276 gold-rhodium coated diaphragm**

Measuring cell	10 mbar	30 mbar	100 mbar	500 mbar
Influence of the system pressure to the zero point	$\pm 0.15 \%$ of URL/7 bar	$\pm 0.35 \%$ of URL/70 bar	$\pm 0.15 \%$ of URL/70 bar	$\pm 0.075 \%$ of URL/70 bar
Influence of the system pressure to the span	$\pm 0.035 \%$ of URL/7 bar	$\pm 0.14 \%$ of URL/70 bar	$\pm 0.14 \%$ of URL/70 bar	$\pm 0.14 \%$ of URL/70 bar

Measuring cell	3 bar	16 bar	40 bar
Influence of the system pressure to the zero point	$\pm 0.075 \%$ of URL/7 bar	$\pm 0.075 \%$ of URL/70 bar	$\pm 0.075 \%$ of URL/70 bar
Influence of the system pressure to the span	$\pm 0.14 \%$ of URL/7 bar	$\pm 0.14 \%$ of URL/70 bar	$\pm 0.14 \%$ of URL/70 bar

36236-EN-130417

## Tantalum diaphragm

Measuring cell	10 mbar	30 mbar	100 mbar	500 mbar
Influence of the system pressure to the zero point	±0.28 % of URL/7 bar	±0.70 % of URL/70 bar	±0.42 % of URL/70 bar	±0.14 % of URL/70 bar
Influence of the system pressure to the span	±0.28 % of URL/7 bar	±0.70 % of URL/70 bar	±0.42 % of URL/70 bar	±0.14 % of URL/70 bar

Measuring cell	3 bar	16 bar	40 bar
Influence of the system pressure to the zero point	±0.14 % of URL/7 bar	±0.14 % of URL/70 bar	±0.14 % of URL/70 bar
Influence of the system pressure to the span	±0.14 % of URL/7 bar	±0.14 % of URL/70 bar	±0.14 % of URL/70 bar

### Total accuracy

#### Total Performance - Basic version

The specification "Total Performance" comprises non-linearity incl. hysteresis and non-repeatability, thermal change of the zero point and static pressure influence ( $p_{st} = 70 \text{ bar}$ ).

Total Performance

- 316L, Alloy, gold-rhodium diaphragm ±0.15 % of the set span<sup>13)14)</sup>
- Tantalum diaphragm ±0.30 % of the set span<sup>15)16)</sup>

#### Total Error - basic version

The specification "Total Error" comprises the longterm stability and the total performance.

Diaphragm material	Measuring range	Total Error
316L, Alloy, gold rhodium	< 500 mbar	0.33 % of the measuring range end value/year
	from 500 mbar	0,20 % of the measuring range final value
Tantalum	< 500 mbar	0.48 % of the measuring range end value/year
	from 500 mbar	0.35 % of the measuring range end value/year

### Heating time - all versions

Warm-up time ≤ 10 s

### Long-term stability (according to DIN 16086 and IEC 60770-1)

Applies to **digital** interfaces (HART, Profibus PA, Foundation Fieldbus) as well as to **analogue** current output 4 ... 20 mA. Specifications refer to the measuring range final value.

Measuring ranges	1 year	5 years
10 mbar, 100 mbar	±0.18 %	-

<sup>13)</sup> For measuring ranges ≥ 500 mbar to TD 2 : 1

<sup>14)</sup> All specifications apply to the temperature range +10 ... +60 °C (+50 ... +140 °F).

<sup>15)</sup> For measuring ranges ≥ 500 mbar to TD 2 : 1

<sup>16)</sup> All specifications apply to the temperature range +10 ... +60 °C (+50 ... +140 °F).

Measuring ranges	1 year	5 years
500 mbar, 3 bar, 16 bar	±0.05 %	±0.125 %

### Ambient conditions

Ambient, storage and transport temperature

- Standard version -40 ... +80 °C (-40 ... +176 °F)
- Version for oxygen applications<sup>17)</sup> -40 ... +60 °C (-40 ... +140 °F)
- Versions IP 66/IP 68 (1 bar) connection cable PE -20 ... +60 °C (-4 ... +140 °F)
- Versions IP 66/IP 68 (1 bar) and IP 68, connection cable PUR -20 ... +80 °C (-4 ... +176 °F)

### Process conditions

The pressure and temperature specifications are used as overview. In general, the max. pressure for the pressure transmitter depends on the weakest (with regard to pressure) link. In detail, the respective specifications of the type label apply.

### Process temperature limits

Specifications apply to the basic version as well as to the minus side with version with single chemical seal<sup>18)</sup>

- With measuring cells PN 420 Lower temperature limit -10 °C (+14 °F).
- With effective pressure lines longer than 100 mm -40 ... +120 °C (-40 ... +248 °F)
- With effective pressure lines longer than 100 mm, process fitting steel C22.8 -40 ... +120 °C (-40 ... +248 °F)

Specifications apply to suitable chemical seals

- Chemical seal CSS plus side, CSB both sides -40 ... +400 °C (-40 ... +752 °F)

### Process temperature limits according to the seal material

Seal material	Temperature limits
FKM	-20 ... +85 °C (-4 ... +185 °F)
FFKM (Kalrez 6375)	-5 ... +85 °C (23 ... +185 °F)
EPDM	-40 ... +85 °C (-40 ... +185 °F)
PTFE	-40 ... +85 °C (-40 ... +185 °F)
NBR	-20 ... +85 °C (-4 ... +185 °F)
Copper	-40 ... +85 °C (-40 ... +185 °F)
Copper, for oxygen application	-20 ... +60 °C (-4 ... +140 °F)
FKM, cleaned	-10 ... +85 °C (+14 ... +185 °F)
FKM, for oxygen application	-10 ... +60 °C (-4 ... +140 °F)
PTFE, for oxygen application	-20 ... +60 °C (-4 ... +140 °F)

### Process pressure limits according to measuring range

<sup>17)</sup> Up to 60 °C (140 °F).

<sup>18)</sup> For the version for oxygen application, note chapter "Oxygen applications".

Nominal range	Nominal pressure	Overload one-sided	Overload two-sided
10 mbar (1 kPa)	160 bar (16000 kPa)	160 bar (16000 kPa)	240 bar (24000 kPa)
30 mbar (3 kPa)	160 bar (16000 kPa)	160 bar (16000 kPa)	240 bar (24000 kPa)
100 mbar (10 kPa)	160 bar (16000 kPa)	160 bar (16000 kPa)	240 bar (24000 kPa)
500 mbar (50 kPa)	160 bar (16000 kPa) 420 bar (42000 kPa)	160 bar (16000 kPa) 420 bar (42000 kPa)	240 bar (24000 kPa) 630 bar (63000 kPa)
3 bar (300 kPa)	160 bar (16000 kPa) 420 bar (42000 kPa)	160 bar (16000 kPa) 420 bar (42000 kPa)	240 bar (24000 kPa) 630 bar (63000 kPa)
16 bar (1600 kPa)	160 bar (16000 kPa) 420 bar (42000 kPa)	160 bar (16000 kPa) 420 bar (42000 kPa)	240 bar (24000 kPa) 630 bar (63000 kPa)
40 bar (4000 kPa)	160 bar (16000 kPa) 420 bar (42000 kPa)	Plus side: 160 bar (16000 kPa) 420 bar (42000 kPa) Minus side: 100 bar (10000 kPa)	240 bar (24000 kPa) 630 bar (63000 kPa)

#### Process pressure limits with seal material FFKM (Kalrez 6375)

Nominal pressure	Overload one-sided	Overload two-sided
100 bar (10000 kPa)	100 bar (10000 kPa)	150 bar (15000 kPa)

Min. system pressure with all measuring ranges 0.1 mbar<sub>abs</sub> (10 Pa<sub>abs</sub>)

Vibration resistance (mechanical vibrations with 5 ... 100 Hz), depending on the version as well as the material and series of the electronics housing<sup>19)</sup>

- Single and double chamber plastic housing, single chamber Aluminium housing 4 g
- Double chamber Aluminium housing, single chamber stainless steel housing 1 g
- Double chamber stainless steel housing <1 g

Shock resistance Acceleration 100 g/6 ms<sup>20)</sup>

#### Electromechanical data - version IP 66/IP 67

Cable entry/plug<sup>21)</sup>

<sup>19)</sup> Tested according to the guidelines of German Lloyd, GL directive 2.

<sup>20)</sup> Tested according to EN 60068-2-27.

<sup>21)</sup> Depending on the version M12 x 1, according to ISO 4400, Harting, 7/8" FF.

– Single chamber housing	– 1 x cable gland M20 x 1.5 (cable: ø 5 ... 9 mm), 1 x blind plug M20 x 1.5 or: – 1 x closing cap ½ NPT, 1 x blind plug ½ NPT or: – 1 x plug (depending on the version), 1 x blind stopper M20 x 1.5 or: – 2 x blind plug M20 x 1,5
Spring-loaded terminals for wire cross-section	< 2.5 mm <sup>2</sup> (AWG 14)

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**Electromechanical data - version IP 66/IP 68 (1 bar)**


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## Cable entry

– Single chamber housing	– 1 x IP 68 cable gland M20 x 1.5; 1 x blind plug M20 x 1.5 or: – 1 x closing cap ½ NPT, 1 x blind plug ½ NPT
--------------------------	---

## Connection cable

– Configuration	four wires, one suspension wire, one breather capillary, screen braiding, metal foil, mantle
– Wire cross-section	0.5 mm <sup>2</sup> (AWG 20)
– Wire resistance	< 0.036 Ω/m (0.011 Ω/ft)
– Tensile strength	> 1200 N (270 pounds force)
– Standard length	5 m (16.4 ft)
– Max. length	1000 m (3281 ft)
– Min. bending radius at 25 °C/77 °F	25 mm (0.985 in)
– Diameter approx.	8 mm (0.315 in)
– Colour - Non-Ex version	Black
– Colour - Ex-version	Blue

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**Electromechanical data - version IP 66/IP 68 with external electronics**


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## Connection cable between IP 68 instrument and external housing:

– Configuration	Four wires, screen braiding, inner cover, screen braiding, outer cover
– Wire cross-section	0.5 mm <sup>2</sup> (AWG 20)
– Standard length	5 m (16.40 ft)
– Max. length	25 m (82.02 ft)
– Min. bending radius at 25 °C/77 °F	25 mm (0.985 in)
– Diameter approx.	8 mm (0.315 in)
– Colour	Blue

Cable entry/plug<sup>22)</sup>

<sup>22)</sup> Depending on the version M12 x 1, according to ISO 4400, Harting, 7/8" FF.

- External housing
- 2 x cable gland M20 x 1.5 (cable:  $\varnothing$  5 ... 9 mm), 1 x blind plug M20 x 1.5
- or:
- 1 x cable gland M20 x 1.5, 1 x plug (depending on version), 1 x blind plug M20 x 1.5

Spring-loaded terminals for wire cross-section up to 2.5 mm<sup>2</sup> (AWG 14)

## Display and adjustment module

Voltage supply and data transmission	through the sensor
Indication	LC display in dot matrix
Adjustment elements	4 keys
Protection rating	
– unassembled	IP 20
– mounted into the sensor without cover	IP 40
Material	
– Housing	ABS
– Inspection window	Polyester foil

## Voltage supply

Operating voltage	
– Non-Ex instrument	12 ... 36 V DC
– Ex-ia instrument	12 ... 30 V DC
– Exd instrument	18 ... 36 V DC
Operating voltage with illuminated display and adjustment module	
– Non-Ex instrument	20 ... 36 V DC
– Ex-ia instrument	20 ... 30 V DC
– Exd instrument	20 ... 36 V DC
Permissible residual ripple	
– < 100 Hz	$U_{ss} < 1 \text{ V}$
– 100 Hz ... 10 kHz	$U_{ss} < 10 \text{ mV}$
Load	see diagram

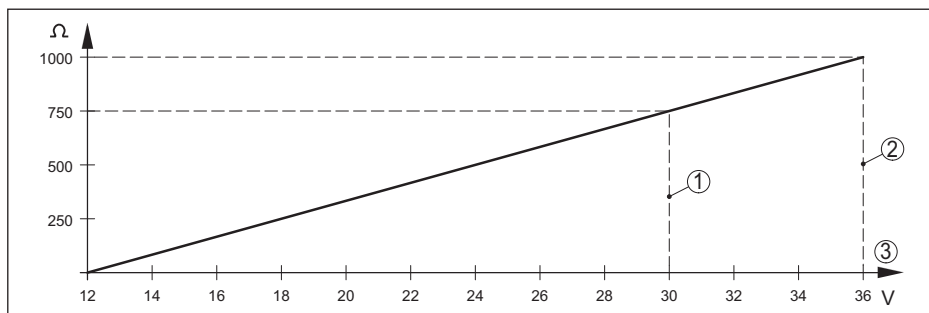


Fig. 53: Voltage diagram

- 1 Voltage limit Ex-ia instrument  
 2 Voltage limit non-Ex/Ex-d instrument  
 3 Operating voltage

### Electrical protective measures

#### Protection rating

- |  |                |
|--|----------------|
| – Housing, standard                                      | IP 66/IP 67    |
| – Aluminium and stainless housing (optionally available) | IP 68 (1 bar)  |
| – Process component in IP 68 version                     | IP 68 (25 bar) |
| – External housing                                       | IP 65          |

#### Overvoltage category

III

#### Protection class

II

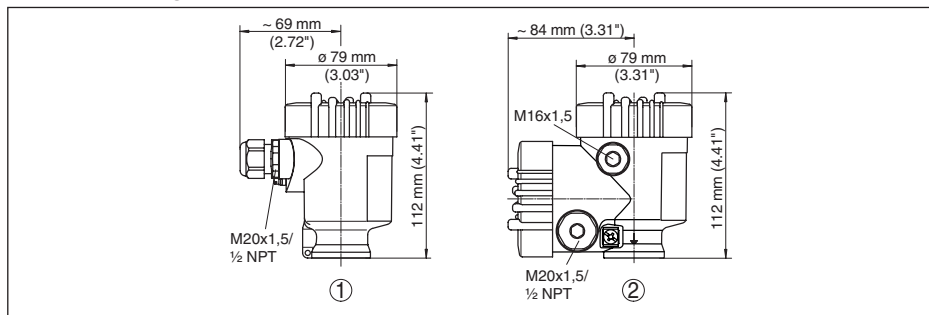
### Approvals

Instruments with approvals can have different technical data depending on the version.

For that reason the associated approval documents of these instruments have to be carefully noted. They are part of the delivery or can be downloaded under [www.vega.com](http://www.vega.com) via "VEGA Tools" and "serial number search" as well as via "Downloads" and "Approvals".

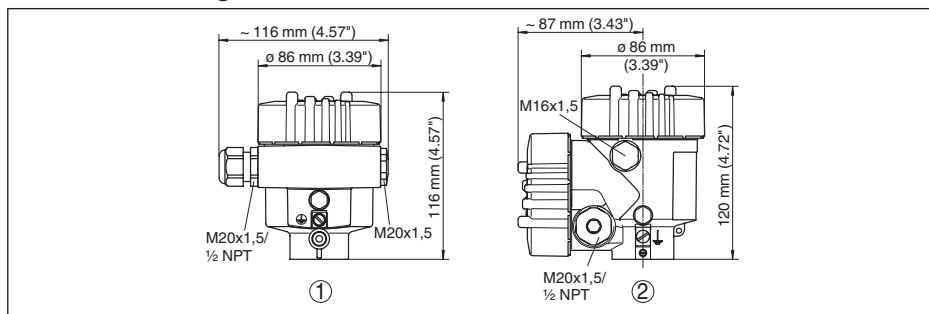
## 10.2 Dimensions

### Plastic housing



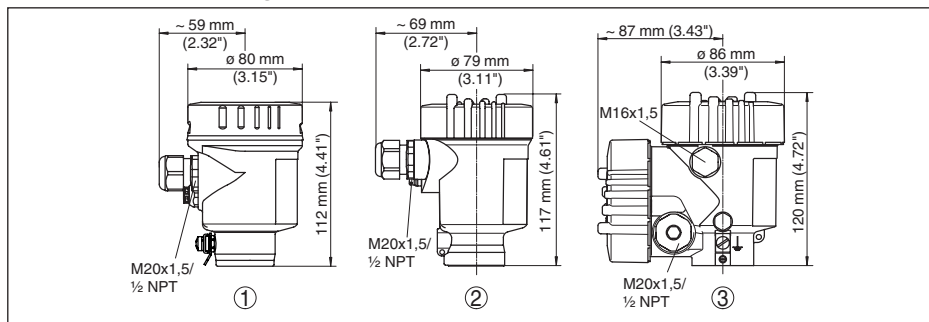
- 1 Single chamber version
- 2 Double chamber version

### Aluminium housing



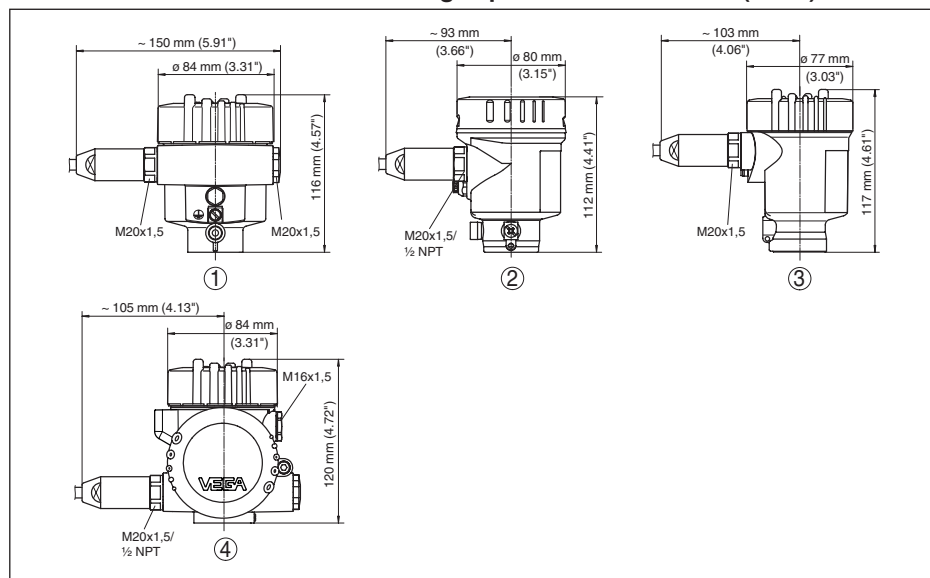
- 1 Single chamber version
- 2 Double chamber version

### Stainless steel housing



- 1 Single chamber version, electropolished
- 2 Single chamber version, precision casting
- 3 Double chamber version, precision casting

# Aluminium and stainless steel housing in protection IP 66/IP 68 (1 bar)



- 1 Single chamber version, Aluminium
- 2 Single chamber version, stainless steel electropolished
- 3 Single chamber version, stainless steel precision casting
- 4 Double chamber housing Aluminium/stainless steel precision casting

# External housing with version IP 68

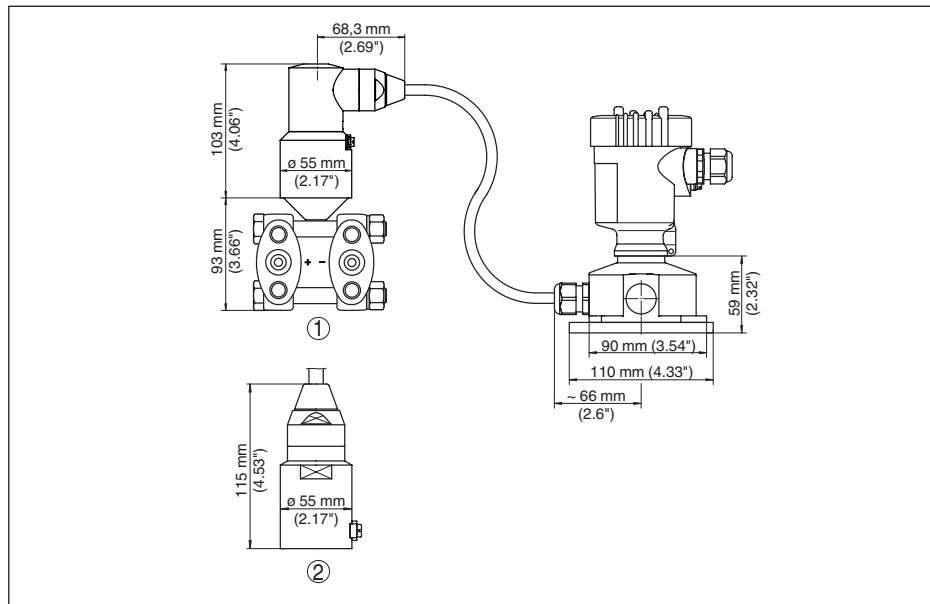


Fig. 58: External housing - Plastic version

- 1 Lateral cable outlet
- 2 Axial cable outlet

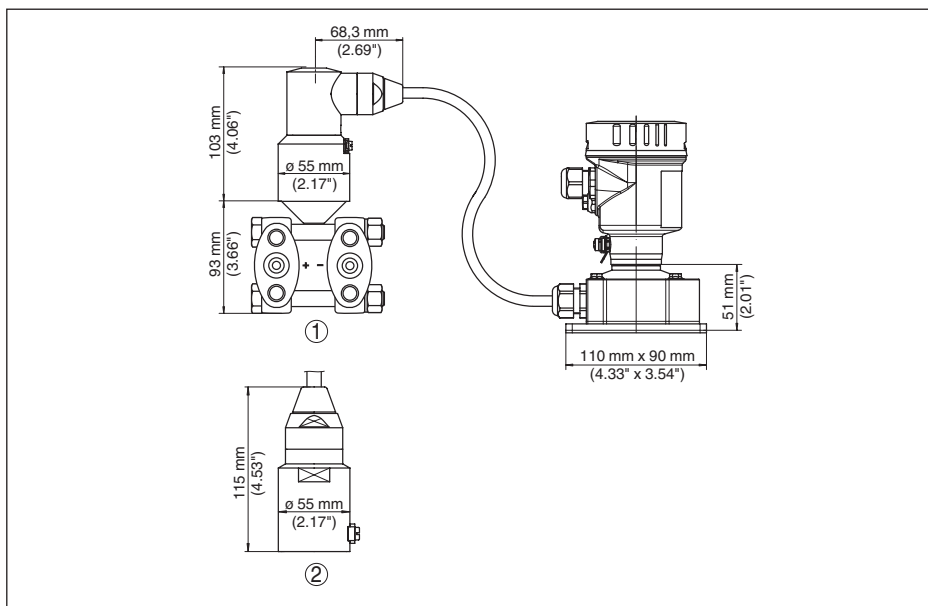


Fig. 59: External housing - Stainless steel version

- 1 Lateral cable outlet
- 2 Axial cable outlet
- 3 Seal 2 mm (0.079 in) - only with 3A approval

Oval flange, connection 1/4-18 NPT or RC 1/4

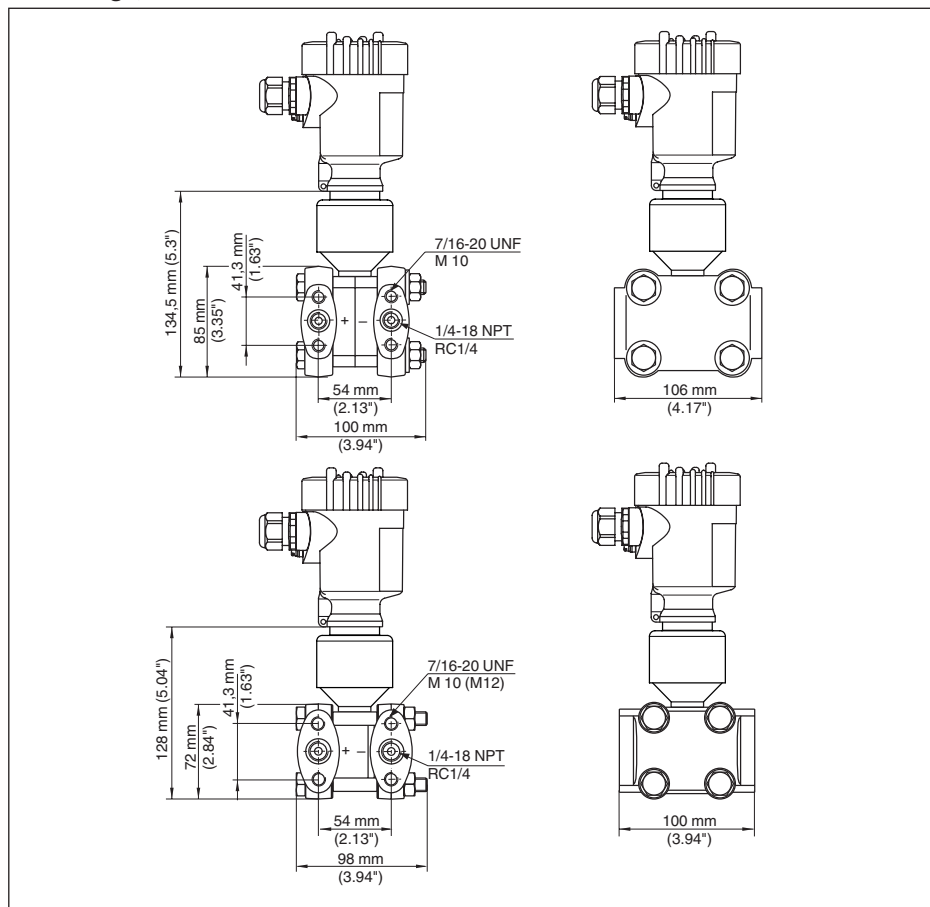


Fig. 60: Top: 10 mbar and 30 mbar measuring cell. Bottom: Measuring cell  $\geq 100$  mbar

Version	Connection	Fastening	Material	Scope of delivery
B	1/4-18 NPT IEC 61518	7/16-20 UNF	Steel C 22.8	incl. 2 vent valves (316L)
D	1/4-18 NPT IEC 61518	7/16-20 UNF	AISI 316L	incl. 2 vent valves (316L)
F	1/4-18 NPT IEC 61518	7/16-20 UNF	Alloy C276	without valves/clos- ing screws
U	RC 1/4	7/16-20 UNF	AISI 316L	incl. 2 vent valves (316L)
1	1/4-18 NPT IEC 61518	PN 160: M10, PN 420: M12	Steel C 22.8	incl. 2 vent valves (316L)

Version	Connection	Fastening	Material	Scope of delivery
2	1/4-18 NPT IEC 61518	PN 160: M10, PN 420: M12	AISI 316L	incl. 2 vent valves (316L)
3	1/4-18 NPT IEC 61518	PN 160: M10, PN 420: M12	Alloy C276	without valves/clos- ing screws

**Oval flange, connection 1/4-18 NPT or RC 1/4, with lateral ventilation**

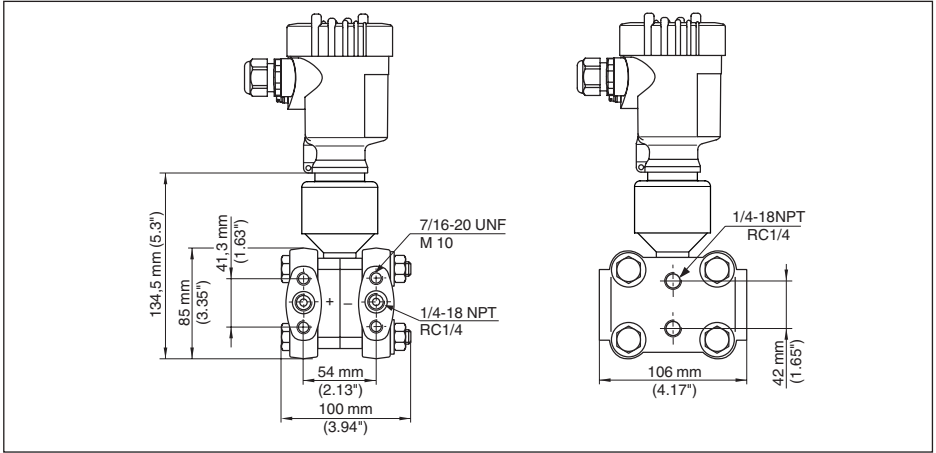


Fig. 61: 10 mbar and 30 mbar measuring cell

Version	Connection	Fastening	Material	Scope of delivery
C	1/4-18 NPT IEC 61518	7/16-20 UNF	Steel C 22.8	incl. 4 closing screws (AISI 316L) and 2 ventilation valves
E	1/4-18 NPT IEC 61518	7/16-20 UNF	AISI 316L	incl. 4 closing screws (AISI 316L) and 2 ventilation valves
H	1/4-18 NPT IEC 61518	7/16-20 UNF	Alloy C276	without valves/clos- ing screws
V	RC 1/4	7/16-20 UNF	AISI 316L	without valves/clos- ing screws

# Oval flange, prepared for chemical seal connection

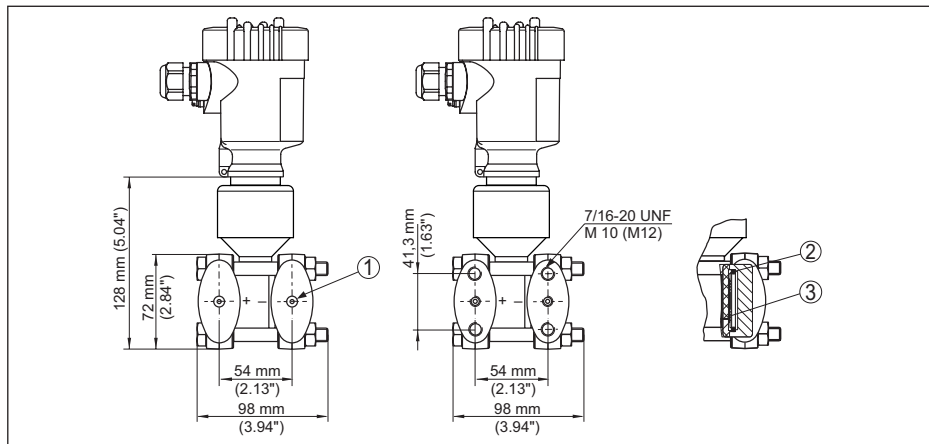


Fig. 62: left: Process fitting VEGADIF 65 prepared for chemical seal assembly. right: Position of the copper ring seal

- 1 Chemical seal connection
- 2 Copper ring seal
- 3 Cup diaphragm

### 10.3 Industrial property rights

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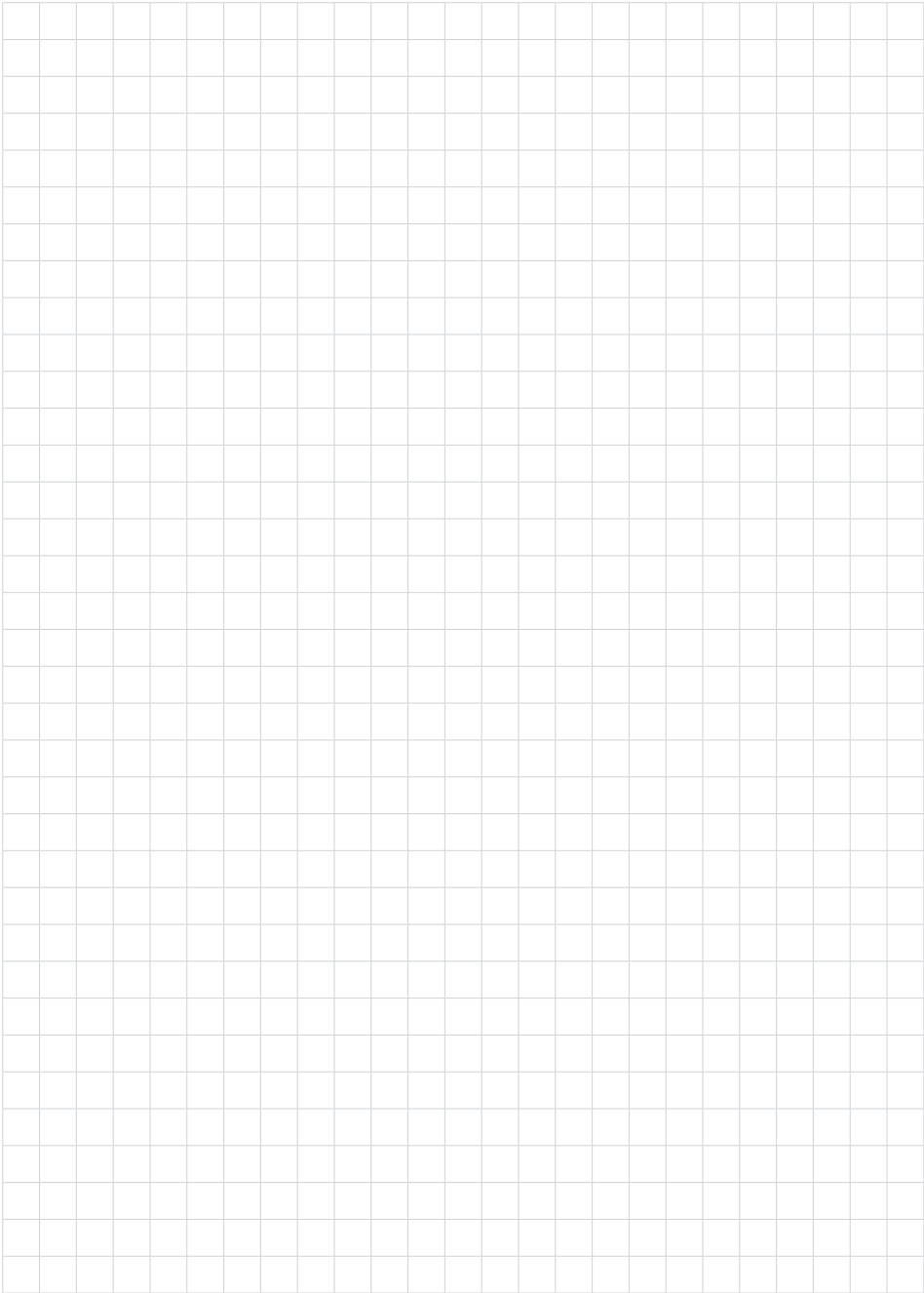
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36236-EN-130417